Sustainable Minds

Transparency Report (EPD)



SM Transparency Catalog ▶ W. R. MEADOWS ▶ AIR-SHIELD™ LMP, LSR, TMP



# AIR-SHIELD™ LMP, LSR, TMP

AIR-SHIELD fluid-applied membranes are water-based air/liquid moisture barriers that cure to form a tough, seamless, elastomeric membrane. AIR-SHIELD fluidapplied membranes exhibit excellent resistance to air leakage. When properly applied as a drainage plane, AIR-SHIELD fluid-applied membranes prohibit liquid water intrusion into the substrate.



# Performance dashboard



## Features & functionality

## **AIR-SHIELD LMP**

AIR-SHIELD LMP is a water-based air/liquid moisture barrier that cures to form a tough, seamless, elastomeric membrane.

## AIR-SHIELD LSR

AIR-SHIELD LSR is an asphalt-free, singlecomponent, synthetic rubber based liquid air/vapor and liquid moisture barrier.

## AIR-SHIELD TMP

AIR-SHIELD TMP is a water-based air/liquid moisture barrier that cures to form a tough, seamless, elastomeric membrane.

### Visit W.R. MEADOWS for more product information:

AIR-SHIELD LMP AIR-SHIELD LSR AIR-SHIELD TMP

## MasterFormat® 07 27 26

AIR-SHIELD Guide Specs

For spec help, contact us or call 800-342-5976.

### **Environment & materials**

## Improved by:

Made in the United States

USGBC member

CAGBC member

VOC CONTENT:

AIR-SHIELD LMP: 99 g/L AIR-SHIELD LSR: 115 g/L AIR-SHIELD TMP: 133 g/L

## Certifications, rating systems & disclosures:

Health Product Declaration

Product ingredients do not contain chemicals in the Living Building Challenge Red List

Build America, Buy America Act compliant

# See LCA, interpretation & rating systems







# SM Transparency Report (EPD)™

**FPD** LCA 3rd-party reviewed Transparency Report (EPD) 3rd-party verified Validity: 03/xx/25 – 03/xx/30

SM-WRM - 03xx2025 - 001

This Environmental Product Declaration (EPD) was externally verified by Lindita Bushi, PhD, Senior Research Associate at Athena, in accordance with ISO 21930:2017, ASTM International. (2023). Product Category Rules (PCR) for Preparing an Environmental Product Declaration (EPD) for Water-Resistive and Air Barriers as well as ISO 14025:2006.

# Athena Sustainable Materials

600 Grings Hill Road Sinking Spring, PA 19608 (610) 985-0933



## SUMMARY

Reference PCR

Regions; system boundaries North America; Cradle-to-gate

Declared unit: 1 m<sup>2</sup> LCIA methodology: TRACI 2.1

LCA software; LCI database SimaPro Developer 9.6; ecoinvent v3.10, US-EI 2.2

Public LCA:

LCA of W. R. MEADOWS Air and

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and reviewed by Lindita Bushi, PhD, Senior Research

## W.R. MEADOWS, Inc.

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Contact us

AIR-SHIELD™ LMP, LSR, TMP

# LCA results & interpretation

Sustainable Minds

Scope and summary What's causing the greatest impacts

AIR-SHIELD™ LMP

**Application** 

**♥ Cradle to gate** ○ Cradle to gate with options ○ Cradle to grave

## $\mathsf{AIR}\text{-}\mathsf{SHIELD}^{\scriptscriptstyle{\mathsf{IM}}}\,\mathsf{LMP}\ \mathsf{is}\ \mathsf{a}\ \mathsf{water}\text{-}\mathsf{based},\ \mathsf{liquid}\text{-}\mathsf{applied}\ \mathsf{air}\ \mathsf{and}\ \mathsf{moisture}\ \mathsf{barrier}\ \mathsf{that}$ cures into a seamless, elastomeric membrane, preventing liquid water intrusion.

AIR-SHIELD LMP prohibits liquid water intrusion into the substrate. It is compatible with various surfaces and meets ABAA requirements and ASTM E2357 and ASTM E2178 standards. **Declared unit** One square meter weighing 1.775 kg (1.775 kg/m²), typically applied at 55 mil wet thickness. The theoretical coverage rate (not including waste) at that

Compatible with various surfaces, when properly applied as a drainage plane,

# thickness is approximately 29 $ft^2/gal$ (0.72 $m^2/L$ ) to attain a 23 mil dry thickness. **Product density:** 10.67 lbs/gal = 1.278 kg/L

Coverage rate (kg/m<sup>2</sup>):  $(1.278 \text{ kg/L})/(0.72 \text{ m}^2/\text{L}) = 1.775 \text{ kg/m}^2$ % solids by weight: 65% Manufacturing data

Reporting period: January 2023 – December 2023 Location: Cartersville, GA; Fort Worth, TX; and Hampshire, IL

**Material composition by wt%** 

Sensitivity analysis Sensitivity analyses were performed to check the robustness of the results where the highest potential environmental impacts are occurring. Since there

## their usage to assess the impact of decreasing their presence in those products.

MATERIAL

**Polymers** 

3.00E-01

2.50E-01

2.00E-01

**Mineral Filler** 

Global warming potential was evaluated for sensitivity since W. R. Meadows is interested in the potential CO<sub>2</sub>-equivalent emissions of its products. Decreasing the amount of styrene butadiene copolymer by 10% could reduce the total GWP by 2.9%, and decreasing the amount of LLDPE resin could lower the total GWP by 13.8%. This shows that global warming potential is sensitive to the amount of LLDPE resin present in the products.

were two raw materials which contributed the most to total impacts across air

and vapor barrier products evaluated, sensitivity analyses were conducted on

**Additives** 10-30% Calcium carbonate 10-15% Water 10-15% Oils 8-10% **Plasticizer** 1-3% **Pigment** <1% Packaging, pallet <1% Packaging, steel drum 1-3% Packaging, plastic pail 1-3% Packaging, stretch film <1%

Average plant impacts by life cycle stage [mPts/decl unit]

LIFE CYCLE STAGE

**Transportation** 

Manufacturing

Raw material acquisition



## Across all locations, the total potential ${\rm CO_2}$ -equivalent emissions generated during the cradle-to-gate stage of 1 m<sup>2</sup> of AIR-SHIELD LMP production is 3.79-

# 3.95 kg CO<sub>2</sub>-eq. Raw material supply contributes 3.01-3.03 kg CO<sub>2</sub>-eq,

All life cycle stages

accounting for 75-85% of the total results. This is primarily due to the polymers used as a raw material input for this product. Ozone depletion, fossil fuel depletion, and eutrophication were the most impacted categories in this stage. The manufacturing stage was the second highest contributor (at 15-20% to GWP), mostly due to the energy required for production at the facility. Transportation accounts for the least of the impacts among all impact categories. Raw material acquisition The raw material acquisition (A1) stage has the most significant contribution to most impact categories, primarily due to the polymers. The

The transportation (A2) of raw materials is the least impactful contributor to the total results. Materials are sourced from within America and transported via semi-truck to the manufacturing facility.

polymers also contribute the highest percentage to the material composition.

# Manufacturing (A3) is the second highest contributor to most impact

WT%

35-40%

15-20%

MPTS/DECL. UNIT

1.74E-01

1.20E-02

3.99F-02

Manufacturing

**Transportation** 

categories. The primary driver of environmental impacts within the manufacturing stage is the energy required to produce the panels. However, impacts from the manufacturing stage dominate the results for global warming, ozone depletion, and fossil fuel depletion, stemming primarily from the use of electricity and natural gas. Activities in this stage also include final

product packaging and manufacturing waste disposal. **Embodied carbon** 

Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The average embodied carbon across three plants per declared unit of AIR-SHIELD™ LMP is 3.86E+00 kg CO<sub>2</sub>-eq. How we're making it greener

• W. R. MEADOWS utilizes OEE (Overall Equipment Effectiveness) to

OEE identifies inefficiencies and wasted energy: By monitoring

equipment performance, it uncovers downtime, slow speeds, and

optimize manufacturing processes and reduce energy consumption.

## • Energy-saving improvements through OEE: Meadows has achieved streamlined processes, better scheduling, reduced machine wear, and

quality defects.

- lower energy costs. • Reduction in scrap and waste: OEE insights help identify performance issues, reducing defects, delays, and material waste while enhancing
- Supports sustainability and environmental goals: By lowering energy use and cutting carbon footprints, OEE fosters more sustainable manufacturing practices.

(X) A3 Manufacturing

3.99E-02 mPts

6.19E-01

1.20E-04

6.19E-01

6.68E-01

1.20E-04

6.68E-01

1.01E-08

2.31E-03

3.31E-04

6.06E-01

120F-04

6.06E-01

6.56E-01

1.20E-04

6.56E-01

9.26E-09

2.28E-03

3.27E-04

3.81E-02

4.91E-04

43.02%

28.33%

23.57%

1.27E-08

2.55E-03

3.48E-04

4.02E-02

5.07E-04

43.75%

28.22%

22.89%

9.88E-01

A2 TRANSPORT

(X) A2 Transport

1.20E-02 mPts

1.10E-01

1.10E-01

1.09E-01

0.00E+00

1.09E-01

1.68E-09

1.29E-04

9.43E-06

1.92E-01

0.00F+00

1.92E-01

1.90E-01

1.90E-01

2.94E-09

2.25E-04

1.65E-05

3.47E-03

1.27%

11.70%

13.38%

3.70E-09

2.83E-04

2.07E-05

4.35E-03

7.42E-05

14.13%

16.23%

4.55E-01

0.00E+00

0.00E+00

See how we make it greener

GWP, IPCC  $_{\rm BIOGENIC}$ 

GWP, TRACI 2.1 TOTAL

GWP, IPCC FOSSIL

Ozone depletion

Acidification

Eutrophication

GWP, IPCC TOTAL

GWP, IPCC BIOGENIC

GWP, TRACI 2.1 TOTAL

GWP, TRACI 2.1 FOSSIL

Ozone depletion

Acidification

Eutrophication

Impact category

Impact category Carcinogenics

Non-carcinogenics

Ozone depletion

Acidification

Eutrophication

Impact category

Respiratory effects

Non-carcinogenics

Fossil fuel depletion

**Ecotoxicity** 

Smog

Human health damage

**Ecotoxicity** 

Smog

GWP, TRACI 2.1 BIOGENIC

Human health damage

GWP, IPCC FOSSIL

Human health damage

Electricity and natural gas Materials or processes contributing >20% to Extraction and preprocessing of Truck transportation to consumption during the total impacts in each life cycle stage polymers and other raw materials. manufacturing facility. manufacturing process. Life cycle impact results per declared unit of AIR-SHIELD™ LMP (Cartersville, GA) A2 TRANSPORT A1 RAW MATERIAL SUPPLY A3 MANUFACTURING **Ecological damage** Impact category Unit GWP, IPCC TOTAL

### GWP, TRACI 2.1 BIOGENIC 0 kg CO<sub>2</sub> eq -1.20E-04 GWP, TRACI 2.1 FOSSIL kg CO<sub>2</sub> eq 3.01E+00

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CFC-11 eq

kg SO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg SO<sub>2</sub> eq

kg N eq

 $kg O_3 eq$ 

Unit

CTU<sub>h</sub>

CTU<sub>h</sub>

CTU

kg CFC-11 eq

 $kg SO_2 eq$ 

kg N eq

Unit

CTU<sub>h</sub>

CTU

MJ surplus

Additional environmental information

kg O<sub>3</sub> eq

 $kg PM_{2.5} eq$ 

kg CFC-11 eq

kg N eq

**SM Single Score** Learn about SM Single Score results

Impacts per declared unit

1.74E-01 mPts

3.09E+00

-1.20E-04

3.09E+00

3.01E+00

1.05E-07

9.82E-03

2.21E-03

0

| Impact category  | Unit                    |     |                        |              |                  |
|--|-------------------------|-----|------------------------|--------------|------------------|
| Smog   | kg O₃ eq                | •   | 1.32E-01               | 1.98E-03     | 3.85E-02         |
| Respiratory effects  | kg PM <sub>2.5</sub> eq | •   | 1.62E-03               | 3.38E-05     | 4.94E-04         |
| Additional environ   | mental informat         | ion |                        |              |                  |
| Impact category  | Unit                    |     |                        |              |                  |
| Carcinogenics  | CTU <sub>h</sub>        | ?   | 55.88%                 | 0.73%        | 43.39%           |
| Non-carcinogenics  | CTU <sub>h</sub>        | ?   | 62.85%                 | 7.01%        | 30.14%           |
| Ecotoxicity  | CTU <sub>e</sub>        | •   | 66.85%                 | 8.12%        | 25.03%           |
| Fossil fuel depletion  | MJ surplus              | 0   | 1.04E+01               | 2.07E-01     | 9.95E-01         |
| Life cycle impact results per declared unit of AIR-SHIELD™ LMP (Forth Worth, TX) |                         |     |                        |              |                  |
| LIFE CYCLE STAGE   |                         |     | A1 RAW MATERIAL SUPPLY | A2 TRANSPORT | A3 MANUFACTURING |
| LIFE CYCLE STAGE  Ecological damage  |                         |     | A1 RAW MATERIAL SUPPLY | A2 TRANSPORT | A3 MANUFACTURING |

### Respiratory effects $kg PM_{2.5} eq$ 1.62E-03 5.91E-05 Additional environmental information

55.70%

59.97%

63.05%

0

0

1.32E-01

3.09E+00

-1.20E-04

3.09E+00

3.01E+00

-1.20E-04

3.01E+00

1.05E-07

9.82E-03

2.21E-03

0

0

| Fossil fuel depletion  | MJ surplus            | 0 | 1.04E+01               | 3.62E-01     | 9.78E-01         |  |
|--|-----------------------|---|------------------------|--------------|------------------|--|
| Life cycle impact results per declared unit of AIR-SHIELD™ LMP (Hampshire, IL) |                       |   |                        |              |                  |  |
| LIFE CYCLE STAGE   |                       |   | A1 RAW MATERIAL SUPPLY | A2 TRANSPORT | A3 MANUFACTURING |  |
| Ecological damage  |                       |   |                        |              |                  |  |
| Impact category  | Unit                  |   |                        |              |                  |  |
| GWP, IPCC TOTAL  | kg CO <sub>2</sub> eq | 0 | 3.09E+00               | 2.41E-01     | 6.47E-01         |  |
| GWP, IPCC BIOGENIC   | kg CO₂ eq             | 0 | -1.20E-04              | 0.00E+00     | 1.20E-04         |  |
| GWP, IPCC FOSSIL   | kg CO₂ eq             | 0 | 3.09E+00               | 2.41E-01     | 6.46E-01         |  |
| GWP, TRACI 2.1 TOTAL   | kg CO <sub>2</sub> eq | • | 3.01E+00               | 2.38E-01     | 6.96E-01         |  |
| GWP, TRACI 2.1 BIOGENIC  | kg CO <sub>2</sub> eq | 0 | -1.20E-04              | 0.00E+00     | 1.20E-04         |  |
| GWP, TRACI 2.1 FOSSIL  | kg CO <sub>2</sub> eq | 0 | 3.01E+00               | 2.38E-01     | 6.95E-01         |  |

### Impact category Unit CTU<sub>h</sub> 0 54.68% 1.57% Carcinogenics

57.65%

60.88%

1.04E+01

0

0

1.05E-07

9.82E-03

2.21E-03

1.32E-01

1.62E-03

| References   | Rating systems   |
|--|--|
| LCA Background Report  LCA of W. R. MEADOWS Water Resistive and Air Barriers, 2025. Developed using the IPCC Fifth Assessment Report (AR5) 100-year time, TRACI v2.1, CML, and Cumulative Energy Demand (LHV) impact assessment methodologies, | The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance. |
| SimaPro Analyst 9.6 software, and ecoinvent v3.10 and US-EI 2.2 databases.   | LEED BD+C: New Construction   v4 - LEED v4  Building product disclosure and optimization   |
| ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures   | Environmental product declarations   |
| ISO 21930:2017, Sustainability in buildings and civil engineering works<br>Core rules for environmental product declarations of construction products  | Industry-wide (generic) EPD ½ product  |
| and services   | ❖ Product-specific Type III EPD       1 product  |

# PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 §5.5 are met. It should be noted that different

**Download PDF** SM Transparency Report/ EPD

and Paul H. Shipp (USG Corporation).

LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should  $\,$ continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes. Comparison of the environmental performance of structural and architectural wood products using EPD information shall be based on the product's use and impacts at the construction works level, and therefore EPDs may not be used for comparability purposes when not considering the construction works energy use phase as instructed under this PCR. Full conformance with the PCR for structural and architectural wood products allows EPD comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category Part B PCR, and use equivalent scenarios with respect to construction works. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

ASTM PCR for Water-Resistive and Air Barriers (UNCPC 54530 and/or CSI MasterFormat DESIGNATIONS 072500, 072600 and 072700); Version 3.0,

t.gloria@industrial-ecology.com); Graham Finch (RDH, Building Science, Inc.)

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that

enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. This

September 2024. PCR review conducted by Thomas Gloria, PhD (chair,

# Industry-wide (generic) EPD Product-specific Type III EPD

Third-party certified type III EPD

☐ Industry-average EPD

Product-specific EPD

**Environmental product declarations** 

Building product disclosure and optimization

**Collaborative for High Performance Schools National** Criteria **MW C5.1 – Environmental Product Declarations** 

1 product

2 points

.5 points

.75 points

1 point

1.5 products

LEED BD+C: New Construction | v4.1 - LEED v4.1

**Green Globes for New Construction and Sustainable** Interiors Materials and resources

NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell

NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

**BREEAM New Construction 2018** Mat 02 - Environmental impacts from construction products

**Environmental Product Declarations (EPD)** 

Multi-product specific EPD

SM Transparency Report (EPD)™

LCA results & interpretation

# SM Transparency Catalog ► W. R. MEADOWS ► AIR-SHIELD™ LMP, LSR, TMP

AIR-SHIELD™ LMP, LSR, TMP

Scope and summary

AIR-SHIELD™ LSR

# **♥ Cradle to gate** ○ Cradle to gate with options ○ Cradle to grave

**Application** AIR-SHIELD LSR (liquid synthetic rubber) is an asphalt-free, single-component,

### synthetic rubber based liquid air/vapor and liquid moisture barrier. AIR-SHIELD LSR cures to form a tough, seamless, elastomeric membrane, which exhibits

excellent resistance to air and moisture transmission. It meets ASTM E 84, Class A, and exceeds ABAA air permeance requirements. **Declared unit** One square meter weighing 2.085 kg (2.085 kg/m<sup>2</sup>), typically applied at 75 mil wet thickness. The theoretical coverage rate (not including waste) at that thickness is approximately 22  $\rm{ft}^2/\rm{gal}$  (0.54  $\rm{m}^2/\rm{L}$ ) to attain a 23 mil dry thickness.

**Product density:** 9.4 lbs/gal = 1.126 kg/L Coverage rate (kg/m<sup>2</sup>):  $(1.126 \text{ kg/L})/(0.54 \text{ m}^2/\text{L}) = 2.085 \text{ kg/m}^2$ % solids by weight: 65%

Sensitivity analyses were performed to check the robustness of the results

and vapor barrier products evaluated, sensitivity analyses were conducted on

# Manufacturing data

Reporting period: January 2023 – December 2023 Location: Cartersville, GA; Fort Worth, TX; and Hampshire, IL Sensitivity analysis

## where the highest potential environmental impacts are occurring. Since there were two raw materials which contributed the most to total impacts across air

products. Global warming potential was evaluated for sensitivity since W. R. Meadows is interested in the potential CO<sub>2</sub>-equivalent emissions of its products. Decreasing

their usage to assess the impact of decreasing their presence in those

**Polymers** 

**Additives** 

3.50E-01

3.00E-01

2.50F-01

2.00E-01

1.50E-01

1.00E-01

5.00F-02

**Mineral Filler** 

**Calcium carbonate** 

the amount of styrene butadiene copolymer by 10% could reduce the total GWP by 2.9%, and decreasing the amount of LLDPE resin could lower the total GWP by 13.8%. This shows that global warming potential is sensitive to the amount of LLDPE resin present in the products. Material composition by wt% MATERIAL WT%

Water 5-10% Oils 10-15% **Pigment** <1% **Silica** <1% Packaging, stretch film <1% Packaging, plastic pail 1-3% Packaging, steel drum 1-3% Packaging, pallet <1%

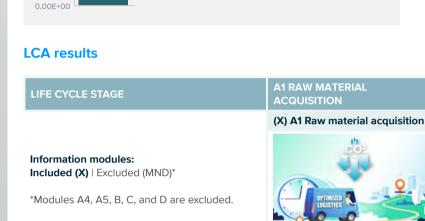
Average plant impacts by life cycle stage [mPts/decl unit]

LIFE CYCLE STAGE

Transportation

Manufacturing

Raw material acquisition



## during the cradle-to-gate stage of 1 m<sup>2</sup> of AIR-SHIELD LSR production is 6-6.5 kg CO<sub>2</sub>-eg. Raw material supply contributes 5.11 kg CO<sub>2</sub>-eg, accounting for 80-

What's causing the greatest impacts

All life cycle stages

85% of the total results. This is primarily due to the polymers used as a raw material input for this product. Ozone depletion, fossil fuel depletion, and respiratory effects were the most impacted categories in this stage. The manufacturing stage was the second highest contributor (~10% to GWP), mostly due to the energy required for production at the facility. Transportation accounts for the least of the impacts among all impact categories. Raw material acquisition The raw material acquisition (A1) stage has the most significant contribution to most impact categories, primarily due to the biobased

Across all locations, the total potential CO<sub>2</sub>-equivalent emissions generated

contributed to over 50% of impacts for seven out of ten impact categories. Transportation The transportation (A2) of raw materials is the least impactful contributor to the total results. Materials are sourced from within America and transported via semi-truck to the manufacturing facility.

binder. While the wood chips account for a much larger share by weight of

contribution to the potential impacts. The starch component in the binder

the raw materials, the use of post-industrial wood chips reduces its

Manufacturing

categories. The primary driver of environmental impacts within the manufacturing stage is the energy required to produce the panels. However, impacts from the manufacturing stage dominate the results for global warming, ozone depletion, and fossil fuel depletion, stemming primarily from

Manufacturing (A3) is the second highest contributor to most impact

## the use of electricity and natural gas. Activities in this stage also include final product packaging and manufacturing waste disposal.

**Embodied carbon** Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The average embodied carbon across three plants per declared unit of AIR-SHIELD $^{\text{\tiny{M}}}$  LSR is 6.21E+00 kg CO $_2$ -eq. How we're making it greener

# OEE identifies inefficiencies and wasted energy: By monitoring

lower energy costs.

**A2 TRANSPORT** (X) A2 Transport

1.29E-01

0.00E+00

1.29E-01

1.27E-01

0.00E+00

1.27E-01

1.98E-09

0.61%

6.29%

6.60%

2.43E-01

1.07E-02

1.82E-04

2.72%

23.59%

24.47%

0.00E+00

3.57E-01

5.53E-09

**Rating systems** 

performance.

55-65%

10-15%

10-30%

5-10%

MPTS/DECL. UNIT

Total impacts = 3.55E-01 mPts

2.98E-01

2.09E-02

3.60E-02

equipment performance, it uncovers downtime, slow speeds, and quality defects. • Energy-saving improvements through OEE: Meadows has achieved streamlined processes, better scheduling, reduced machine wear, and

Reduction in scrap and waste: OEE insights help identify performance

optimize manufacturing processes and reduce energy consumption.

• W. R. MEADOWS utilizes OEE (Overall Equipment Effectiveness) to

# issues, reducing defects, delays, and material waste while enhancing

- Supports sustainability and environmental goals: By lowering energy
- use and cutting carbon footprints, OEE fosters more sustainable manufacturing practices. See how we make it greener

(X) A3 Manufacturing

3.02E-02 mPts

6.29E-01

5.72E-04

6.28E-01

7.48E-01

1.20E-04

7.48E-01

3.62E-09

48.10%

20.42%

10.41%

4.57E-01

2.22E-02

1.74E-04

47.02%

16.41%

8.40%

1.20E-04

7.41E-01

2.81E-09

9.28%

The intent is to reward project teams for selecting products from

LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

**Environmental product declarations** 

☐ Industry-wide (generic) EPD

Industry-wide (generic) EPD

Product-specific Type III EPD

manufacturers who have verified improved life-cycle environmental

4.48E-01

1 product

1 product

2 points

.5 points

1.5 products

Electricity and natural gas

# **SM Single Score** Learn about SM Single Score results

LIFE CYCLE STAGE

Impact category GWP, IPCC  $_{\rm TOTAL}$ 

GWP, IPCC BIOGENIC

**GWP, TRACI 2.1** FOSSIL

Ozone depletion

Impact category Carcinogenics

Non-carcinogenics

Fossil fuel depletion

**Ecotoxicity** 

Smog

**Respiratory effects** 

Impact category

Non-carcinogenics

Carcinogenics

**Ecotoxicity** 

GWP, IPCC FOSSIL

**Ecological damage** 

Impacts per declared unit 2.98E-01 mPts 2.09E-02 mPts Materials or processes contributing >20% to Extraction and preprocessing of Truck transportation to total impacts in each life cycle stage polymers and other raw materials. manufacturing facility. Life cycle impact results per declared unit of AIR-SHIELD™ LSR (Cartersville, GA)

5.26E+00

-5.72E-04

5.26E+00

5.11E+00

1.90E-07

51.30%

73.3%

82.99%

1.97E+01

1.99E-01

2.32E-03

50.25%

60%

67.13%

-1.20E-04

5.11E+00

1.90E-07

0

Life cycle impact results per declared unit of AIR-SHIELD™ LSR (Forth Worth, TX)

0

0

**A1 RAW MATERIAL SUPPLY** 

# consumption during the manufacturing process. **A2 TRANSPORT**

### GWP, TRACI 2.1 TOTAL kg CO<sub>2</sub> eq 5.11E+00 GWP, TRACI 2.1 BIOGENIC kg CO<sub>2</sub> eq -1.20E-04

Unit

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CO₂ eq

Unit

CTU,

 $CTU_h$ 

CTU

**MJ** surplus

kg O₃ eq

Unit

CTU,

CTU<sub>h</sub>

CTU

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CFC-11 eq

**Additional environmental information** 

kg PM<sub>2.5</sub> eq

kg CFC-11 eq

| Acidification                        | kg SO₂ eq               | • | 1.49E-02 | 1.51E-04 | 1.48E-03 |
|--------------------------------------|-------------------------|---|----------|----------|----------|
| Eutrophication                       | kg N eq                 | 0 | 2.49E-03 | 1.11E-05 | 2.74E-04 |
| Human health damag                   | ge                      |   |          |          |          |
| Impact category                      | Unit                    |   |          |          |          |
| Smog                                 | kg O <sub>3</sub> eq    | 0 | 1.99E-01 | 2.33E-03 | 2.24E-02 |
| Respiratory effects                  | kg PM <sub>2.5</sub> eq | 0 | 2.32E-03 | 3.97E-05 | 1.77E-04 |
| Additional environmental information |                         |   |          |          |          |

| LIFE CYCLE STAGE        |                       |   | A1 RAW MATERIAL SUPPLY | A2 TRANSPORT | A3 MANUFACTURING |
|-------------------------|-----------------------|---|------------------------|--------------|------------------|
| Ecological damage       |                       |   |                        |              |                  |
| Impact category         | Unit                  |   |                        |              |                  |
| GWP, IPCC TOTAL         | kg CO₂ eq             | 0 | 5.26E+00               | 5.91E-01     | 6.22E-01         |
| GWP, IPCC BIOGENIC      | kg CO <sub>2</sub> eq | 0 | -5.72E-04              | 0.00E+00     | 5.72E-04         |
| GWP, IPCC FOSSIL        | kg CO <sub>2</sub> eq | 0 | 5.26E+00               | 5.91E-01     | 6.21E-01         |
| GWP, TRACI 2.1 TOTAL    | kg CO <sub>2</sub> eq | 0 | 5.11E+00               | 5.84E-01     | 7.42E-01         |
| GWP, TRACI 2.1 BIOGENIC | kg CO <sub>2</sub> eq | 0 | -1.20E-04              | 0.00E+00     | 1.20E-04         |
| GWP, TRACI 2.1 FOSSIL   | kg CO <sub>2</sub> eq | 0 | 5.11E+00               | 5.84E-01     | 7.41E-01         |
| Ozone depletion         | kg CFC-11 eq          | 0 | 1.90E-07               | 9.06E-09     | 2.81E-09         |
| Acidification           | kg SO₂ eq             | 0 | 1.49E-02               | 6.94E-04     | 1.48E-03         |
| Eutrophication          | kg N eq               | 0 | 2.49E-03               | 5.07E-05     | 2.71E-04         |
| Human health dama       | age                   |   |                        |              |                  |
| Impact category         | Unit                  |   |                        |              |                  |

# Impac GWP, I GWP, I

GWP, TRACI 2.1 BIOGENIC

**GWP, TRACI 2.1** FOSSIL

Ozone depletion

| •                                    |                         |   |          |          |          |
|--------------------------------------|-------------------------|---|----------|----------|----------|
| Acidification                        | kg SO <sub>2</sub> eq   | 0 | 1.49E-02 | 4.23E-04 | 1.48E-03 |
| Eutrophication                       | kg N eq                 | 0 | 2.49E-03 | 3.10E-05 | 2.67E-04 |
| Human health dar                     | nage                    |   |          |          |          |
| Impact category                      | Unit                    |   |          |          |          |
| Smog                                 | kg O <sub>3</sub> eq    | 0 | 1.99E-01 | 6.51E-03 | 2.22E-02 |
| Respiratory effects                  | kg PM <sub>2.5</sub> eq | 0 | 2.32E-03 | 1.11E-04 | 1.74E-04 |
| Additional environmental information |                         |   |          |          |          |
| Impact category                      | Unit                    |   |          |          |          |
| Carcinogenics                        | CTU <sub>h</sub>        | 0 | 50.80%   | 1.68%    | 47.52%   |
| Non-carcinogenics                    | CTU.                    | • | 66.11%   | 15.86%   | 18.03%   |

**Download PDF** SM Transparency Report/ EPD SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. This PCR allows EPD comparability only when the same functional requirements between products are

LCA of W. R. MEADOWS Water Resistive and Air Barriers, 2025. Developed

and Cumulative Energy Demand (LHV) impact assessment methodologies, SimaPro Analyst 9.6 software, and ecoinvent v3.10 and US-EI 2.2 databases.

ISO 14025:2006 Environmental labels and declarations — Type III

using the IPCC Fifth Assessment Report (AR5) 100-year time, TRACI v2.1, CML,

measures for comparative purposes. Comparison of the environmental performance of structural

and architectural wood products using EPD information shall be based on the product's use and impacts at the construction works level, and therefore EPDs may not be used for comparability purposes when not considering the construction works energy use phase as instructed under this  ${\sf PCR.}\ {\sf Full}\ {\sf conformance}\ {\sf with}\ {\sf the}\ {\sf PCR}\ {\sf for}\ {\sf structural}\ {\sf and}\ {\sf architectural}\ {\sf wood}\ {\sf products}\ {\sf allows}\ {\sf EPD}$ comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category Part B PCR, and use equivalent scenarios with respect to construction works. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.v

SM Transparency Report (EPD)™

| Fossil fuel depletion  | MJ surplus            | 0 | 1.97E+01               | 1.12E+00     | 4.48E-01         |  |
|--|-----------------------|---|------------------------|--------------|------------------|--|
| Life cycle impact results per declared unit of AIR-SHIELD™ LSR (Hampshire, IL) |                       |   |                        |              |                  |  |
| LIFE CYCLE STAGE   |                       |   | A1 RAW MATERIAL SUPPLY | A2 TRANSPORT | A3 MANUFACTURING |  |
| Ecological damage  | 11-24                 |   |                        |              |                  |  |
| Impact category  | Unit                  | 0 | 5.26E+00               | 3.61E-01     | 6.22E-01         |  |
| GWP, IPCC  | kg CO <sub>2</sub> eq | Q | -5.72E-04              |              |                  |  |
| GWP, IPCC BIOGENIC   | kg CO₂ eq             |   |                        | 0.00E+00     | 5.72E-04         |  |
| GWP, IPCC FOSSIL   | kg CO₂ eq             | 0 | 5.26E+00               | 3.61E-01     | 6.21E-01         |  |
| GWP, TRACI 2.1 TOTAL   | kg CO₂ eq             | 0 | 5.11E+00               | 3.57E-01     | 7.42E-01         |  |

### Non-carcinogenics **Ecotoxicity CTU**<sub>e</sub> 74.21% 16.51% Fossil fuel depletion MJ surplus 1.97E+01 6.81E-01

| and services   | Product-specific Type III EPD                | 1 рі |
|--|--|------|
| ASTM PCR for Water-Resistive and Air Barriers (UNCPC 54530 and/or CSI        |  |      |
| MasterFormat DESIGNATIONS 072500, 072600 and 072700); Version 3.0,           | LEED BD+C: New Construction   v4.1 - LEED v4 | 4.1  |
| September 2024. PCR review conducted by Thomas Gloria, PhD (chair,           | Building product disclosure and optimization |      |
| t.gloria@industrial-ecology.com); Graham Finch (RDH, Building Science, Inc.) |  |      |
| and Paul H. Shipp (USG Corporation).   | Environmental product declarations           |      |

ensured and the requirements of ISO 21930:2017 §5.5 are met. It should be noted that different  $\label{local_local_local} \mbox{LCA software and background LCI datasets may lead to differences results for upstream or } \mbox{\cite{local_l$ downstream of the life cycle stages declared. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III

environmental declarations. Other categories are being developed and defined and LCA should  $continue \ making \ advances \ in \ their \ development. \ However, the \ EPD \ users \ shall \ not \ use \ additional$ 

# **Collaborative for High Performance Schools National**

○ Industry-average EPD

Product-specific EPD

**MW C5.1 – Environmental Product Declarations** Third-party certified type III EPD

Green Globes for New Construction and Sustainable

**Interiors** Materials and resources

NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell

NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

ction 2018 s from construction products rations (EPD)

Multi-product specific EPD

.75 points 1 point

| BREEAM New Construct Mat 02 - Environmental impacts |  |
|---|--|
| Environmental Product Declara                       |  |

# environmental declarations — Principles and procedures ISO 21930:2017, Sustainability in buildings and civil engineering works --Core rules for environmental product declarations of construction products

References

**LCA Background Report** 

AIR-SHIELD™ TMP

AIR-SHIELD™ LMP, LSR, TMP

# LCA results & interpretation

Sustainable Minds

Scope and summary

**Application** AIR-SHIELD TMP is a water-based air/liquid moisture barrier that cures to form a

resistance to air leakage. When properly applied as a drainage plane, AIR-

**♥ Cradle to gate** Cradle to gate with options Cradle to grave

# tough, seamless, elastomeric membrane. AIR-SHIELD TMP exhibits excellent

SHIELD TMP prohibits liquid water intrusion into the substrate. **Declared unit** One square meter weighing 0.515 kg (0.515 kg/m<sup>2</sup>), typically applied at 16 mil

wet thickness. The theoretical coverage rate (not including waste) at that thickness is approximately 100 ft<sup>2</sup>/gal (2.454 m<sup>2</sup>/L) to attain a 9 mil dry thickness on exterior gypsum sheathing. **Product density:** 10.55 lbs/gal = 1.264 kg/

# Coverage rate $(kg/m^2)$ : $(1.264 kg/L)/(2.454 m^2/L) = 0.515 kg/m^2$

% solids by weight: 65% Manufacturing data Reporting period: January 2023 – December 2023 Location: Cartersville, GA; Fort Worth, TX; and Hampshire, IL

Sensitivity analyses were performed to check the robustness of the results

# Sensitivity analysis

where the highest potential environmental impacts are occurring. Since there were two raw materials which contributed the most to total impacts across air and vapor barrier products evaluated, sensitivity analyses were conducted on

## their usage to assess the impact of decreasing their presence in those products.

MATERIAL

**Polymers** 

3.50E-01

3 00F-01

2 50F-01

Mineral filler

**Material composition by wt%** 

Global warming potential was evaluated for sensitivity since W. R. Meadows is interested in the potential CO<sub>2</sub>-equivalent emissions of its products. Decreasing the amount of styrene butadiene copolymer by 10% could reduce the total GWP by 2.9%, and decreasing the amount of LLDPE resin could lower the total GWP by 13.8%. This shows that global warming potential is sensitive to the amount of LLDPE resin present in the products.

**Additives** 10-15% Calcium carbonate 10-15% Water 8-10% Oils 3-5% **Piament** 1-3% Packaging, plastic pail 1-2% Packaging, steel drum <**1**% Packaging, stretch film <1%

Average plant impacts by life cycle stage [mPts/decl unit]

LIFE CYCLE STAGE

Transportation

Manufacturing

Raw material acquisition



Impacts per declared unit

## Across all locations, the total potential ${\rm CO_2}$ -equivalent emissions generated during the cradle-to-gate stage of 1 m<sup>2</sup> of AIR-SHIELD TMP production is 1.04-1.09 kg CO<sub>2</sub>-eg. Raw material supply contributes 0.824 kg CO<sub>2</sub>-eg, accounting

What's causing the greatest impacts

## for 80-90% of the total results. This is primarily due to the styrene butadiene

All life cycle stages

copolymer used as a raw material input for this product. Ozone depletion, fossil fuel depletion, and eutrophication were the most impacted categories in this stage. The manufacturing stage was the second highest contributor (at 10-20% to GWP), mostly due to the energy required for production at the facility. Transportation accounts for the least of the impacts among all impact categories. Raw material acquisition The raw material acquisition (A1) stage has the most significant contribution to most impact categories, primarily due to the polymers. The polymers also contribute the highest percentage to the material composition.

# The transportation (A2) of raw materials is the least impactful contributor

Transportation

to the total results. Materials are sourced from within America and transported via semi-truck to the manufacturing facility. Manufacturing Manufacturing (A3) is the second highest contributor to most impact

categories. The primary driver of environmental impacts within the manufacturing stage is the energy required to produce the panels. However, impacts from the manufacturing stage dominate the results for global warming, ozone depletion, and fossil fuel depletion, stemming primarily from

## the use of electricity and natural gas. Activities in this stage also include final product packaging and manufacturing waste disposal.

WT%

35-40%

15-20%

MPTS/DECL. UNIT

4.95E-02

3.13E-03

6.00E-02

**Embodied carbon** Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The average embodied carbon across three plants per declared unit of AIR-SHIELD™ TMP is 1.06E+00 kg CO<sub>2</sub>-eq. How we're making it greener

W. R. MEADOWS utilizes OEE (Overall Equipment Effectiveness) to

OEE identifies inefficiencies and wasted energy: By monitoring

equipment performance, it uncovers downtime, slow speeds, and

optimize manufacturing processes and reduce energy consumption.

## • Energy-saving improvements through OEE: Meadows has achieved streamlined processes, better scheduling, reduced machine wear, and

See how we make it greener

quality defects.

- lower energy costs. • Reduction in scrap and waste: OEE insights help identify performance issues, reducing defects, delays, and material waste while enhancing
- Supports sustainability and environmental goals: By lowering energy use and cutting carbon footprints, OEE fosters more sustainable manufacturing practices.

(X) A3 Manufacturing

6.00E-02 mPts

1.34E-01

0.00E+00

1.34E-01

1.52E-01

0.00E+00

1.52E-01

8 22F-10

1.33E-01

1.33E-01

1.50E-01

1.50E-01

6.44E-10

3.18E-04

4.69E-05

4.78E-03

3.78E-05

46.06%

20 19%

11.69%

1.53E-01

1.24E-09

3.57E-04

5.04E-05

5.06E-03

4.00E-05

46.21%

19.56%

11.03%

9.31E-02

0.00E+00

0.00E+00

Electricity and natural gas

**A2 TRANSPORT** 

(X) A2 Transport

3.13E-03 mPts

2.98E-02

0.00E+00

2.98E-02

2.94E-02

0.00E+00

2.94E-02

4 56F-10

5.41E-02

0.00E+00

5.41E-02

5.35E-02

0.00E+00

5.35E-02

8.29E-10

6.35E-05

4.64E-06

9.76E-04

1.20%

12.94%

15.32%

7.74E-02

1.20E-09

9.19E-05

6.72E-06

1.41E-03

2.41E-05

17.6%

20.74%

1.48E-01

**Rating systems** 

# **SM Single Score** Learn about SM Single Score results

Impact category

GWP, IPCC TOTAL

GWP, IPCC  $_{\rm BIOGENIC}$ 

GWP, IPCC FOSSIL

Ozone depletion

GWP, IPCC  $_{TOTAL}$ 

GWP, IPCC BIOGENIC

GWP, TRACI 2.1 TOTAL

GWP, TRACI 2.1 FOSSIL

Ozone depletion

Acidification

Eutrophication

Impact category

Impact category

Carcinogenics

**Ecotoxicity** 

Non-carcinogenics

**GWP, TRACI 2.1** FOSSIL

Human health damage

Ozone depletion

**Acidification** 

Eutrophication

Impact category

**Respiratory effects** 

Non-carcinogenics

Fossil fuel depletion

References

**Ecotoxicity** 

Smog

**Smog** 

GWP, TRACI 2.1 BIOGENIC

Human health damage

GWP, IPCC FOSSIL

Extraction and preprocessing of Truck transportation to Materials or processes contributing >20% to consumption during the polymers and other raw materials. manufacturing facility. total impacts in each life cycle stage manufacturing process. Life cycle impact results per declared unit of AIR-SHIELD™ TMP (Cartersville, GA) LIFE CYCLE STAGE A1 RAW MATERIAL SUPPLY **A2 TRANSPORT Ecological damage** 

4.95E-02 mPts

8.79E-01

0.00E+00

8.79E-01

2.99E-08

### GWP, TRACI 2.1 TOTAL kg CO<sub>2</sub> eq 8.56E-01 GWP, TRACI 2.1 BIOGENIC 0.00E+00 kg CO<sub>2</sub> eq GWP, TRACI 2.1 FOSSIL kg CO<sub>2</sub> eq 8.56E-01

Unit

kg CO₂ eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

ka CFC-11 ea

kg CO<sub>2</sub> eq

kg SO<sub>2</sub> eq

kg N eq

Unit

Unit CTU<sub>h</sub>

CTU<sub>h</sub>

CTU<sub>e</sub>

kg CO<sub>2</sub> eq

kg SO<sub>2</sub> eq

kg N eq

Unit

CTU<sub>b</sub>

CTU

**MJ** surplus

**Additional environmental information** 

kg O<sub>3</sub> eq

kg PM<sub>2.5</sub> eq

kg CFC-11 eq

kg O₃ eq

kg CFC-11 eq

| Acidification                |                          |   |          |          |          |
|------------------------------|--------------------------|---|----------|----------|----------|
| torum catron                 | kg SO₂ eq                | 0 | 2.79E-03 | 3.49E-05 | 3.20E-04 |
| Eutrophication               | kg N eq                  | 0 | 6.28E-04 | 2.56E-06 | 4.75E-05 |
| Human health dama            | ige                      |   |          |          |          |
| mpact category               | Unit                     |   |          |          |          |
| Smog                         | kg O₃ eq                 | 0 | 3.76E-02 | 5.38E-04 | 4.84E-03 |
| Respiratory effects          | kg PM <sub>2.5</sub> eq  | 0 | 4.62E-04 | 9.16E-06 | 3.83E-05 |
| mpact category Carcinogenics | Unit<br>CTU <sub>h</sub> | 0 | 52.98%   | 0.66%    | 46.36%   |
| mpact category               |                          |   |          |          |          |
|                              |                          | 0 |          |          |          |
| Non-carcinogenics            | CTU <sub>h</sub>         | - | 70.71%   | 7.53%    | 21.76%   |
| Ecotoxicity                  | CTU <sub>e</sub>         | 0 | 78.36%   | 9.06%    | 12.59%   |
| ossil fuel depletion         | MJ surplus               | • | 2.97E+00 | 5.62E-02 | 1.01E-01 |

### **Respiratory effects** kg PM<sub>2,5</sub> eq 4.62E-04 1.66E-05 **Additional environmental information**

52 74%

66.88%

72.99%

0

8.79E-01

0.00E+00

8.79E-01

8.56E-01

0.00E+00

8.56E-01

2.99E-08

2.79E-03

6.28E-04

3.76E-02

0

| Fossil fuel depletion  | MJ surplus            | 0 | 2.97E+00               | 1.02E-01     | 9.90E-02         |
|--|-----------------------|---|------------------------|--------------|------------------|
| Life cycle impact results per declared unit of AIR-SHIELD™ TMP (Hampshire, IL) |                       |   |                        |              |                  |
| LIFE CYCLE STAGE   |                       |   | A1 RAW MATERIAL SUPPLY | A2 TRANSPORT | A3 MANUFACTURING |
| Ecological damage  |                       |   |                        |              |                  |
| Impact category  | Unit                  |   |                        |              |                  |
| GWP, IPCC TOTAL  | kg CO₂ eq             | 0 | 8.79E-01               | 7.83E-02     | 1.36E-01         |
| GWP, IPCC BIOGENIC   | kg CO₂ eq             | 0 | 0.00E+00               | 0.00E+00     | 0.00E+00         |
| GWP, IPCC FOSSIL   | kg CO <sub>2</sub> eq | 0 | 8.79E-01               | 7.83E-02     | 1.36E-01         |
| GWP, TRACI 2.1 TOTAL   | kg CO <sub>2</sub> eq | 0 | 8.56E-01               | 7.74E-02     | 1.53E-01         |
| GWP, TRACI 2.1 BIOGENIC  | kg CO <sub>2</sub> eq | 0 | 0.00E+00               | 0.00E+00     | 0.00E+00         |
| GWP, TRACI 2.1 FOSSII  | kg CO <sub>2</sub> eg | Ø | 8.56E-01               | 7.74E-02     | 1.53E-01         |

### **Impact category** Unit Carcinogenics CTU<sub>h</sub> 52.07% 1.71%

62.84%

68.23%

2.97E+00

0

8.56E-01

2.99E-08

2.79E-03

6.28E-04

3.76E-02

4.62E-04

0

| using the IPCC Fifth Assessment Report (AR5) 100-year time, TRACI v2.1, CML, and Cumulative Energy Demand (LHV) impact assessment methodologies, | manufacturers who have verified improved life-cycle environmental performance. |  |  |
|--|--|--|--|
| SimaPro Analyst 9.6 software, and ecoinvent v3.10 and US-EI 2.2 databases.   | LEED BD+C: New Construction   v4 - LEED v4                                     |  |  |
| ISO 14025, "Sustainability in buildings and civil engineering works Core   | Building product disclosure and optimization                                   |  |  |
| rules for environmental product declarations of construction products and services"  | Environmental product declarations   |  |  |
| ISO 21930:2017, "Sustainability in Building Construction — Environmental   | ☐ Industry-wide (generic) EPD ½ product  |  |  |
| Declaration of Building Products" serves as the core PCR.  | ✓ Product-specific Type III EPD 1 product                                      |  |  |

### enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building. This PCR allows EPD comparability only when the same functional requirements between products are

LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes. Comparison of the environmental performance of structural and architectural wood products using EPD information shall be based on the product's use and impacts at the construction works level, and therefore EPDs may not be used for comparability purposes when not considering the construction works energy use phase as instructed under this  ${\sf PCR.}\ {\sf Full}\ {\sf conformance}\ {\sf with}\ {\sf the}\ {\sf PCR}\ {\sf for}\ {\sf structural}\ {\sf and}\ {\sf architectural}\ {\sf wood}\ {\sf products}\ {\sf allows}\ {\sf EPD}$ comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category Part B PCR, and use equivalent scenarios with respect to construction works. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

☐ Industry-wide (generic) EPD

Criteria

Interiors

☐ Industry-average EPD

Product-specific EPD

Product-specific Type III EPD 1.5 products

**Collaborative for High Performance Schools National** 

Green Globes for New Construction and Sustainable

1 product

2 points

.5 points

.75 points

1 point

LEED BD+C: New Construction | v4.1 - LEED v4.1

Building product disclosure and optimization

**Environmental product declarations** 

The intent is to reward project teams for selecting products from

Third-party certified type III EPD

**MW C5.1 – Environmental Product Declarations** 

**Materials and resources** NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell

NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

**BREEAM New Construction 2018** Mat 02 - Environmental impacts from construction products **Environmental Product Declarations (EPD)** 

Multi-product specific EPD

# LCA Background Report LCA of W. P. MEADOWS Water Posistive and Air Barriers, 2025, Developed

September 2024. PCR review conducted by Thomas Gloria, PhD (chair, t.gloria@industrial-ecology.com); Graham Finch (RDH, Building Science, Inc.) and Paul H. Shipp (USG Corporation). Download PDF SM Transparency Report/ EPD

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that

ensured and the requirements of ISO 21930:2017 §5.5 are met. It should be noted that different

ASTM PCR for Water-Resistive and Air Barriers (UNCPC 54530 and/or CSI MasterFormat DESIGNATIONS 072500, 072600 and 072700); Version 3.0,

SM Transparency Report (EPD)™

AIR-SHIELD™ LMP, LSR, TMP

EPD additional content

Sustainable Minds

**Data** Scenarios and additional technical information

Biogenic carbon disclosure in installation stage [A5] While the impacts from

EPD additional content

## Background: This product-specific plant-specific declaration was created by collecting production data from 3 facilities in Cartersville, GA; Fort Worth, TX;

El 2.2 databases.

Product-specific packaging includes poly bags which are typically disposed of at the site of installation. Allocation The W. R. MEADOWS facility produces multiple types of products each year. To allocate electricity and natural gas consumption accurately to each product, total annual energy consumption was distributed based on the

Secondary data sources include those available in the ecoinvent v3.10 and US-

and Hampshire, IL. All unit processes were modeled using primary data.

proportion of each product's annual production (by mass) relative to the total plant production. This approach assigns manufacturing activities proportionally to each product type.

All associated manufacturing resources and waste flows were allocated using

the same approach. There are no co-products produced during their manufacturing processes. The model used in the LCA ensures that the sum of the allocated inputs and outputs of a unit process shall be equal to the inputs and outputs of the unit process before allocation. This means that no double counting or omissions of inputs or outputs through allocation is occurring. Cut-off criteria for the inclusion of mass and energy flows are 1% of renewable

usage, 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exceptions to these criteria are substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass. No known flows are deliberately excluded from this declaration, and no substances considered to be hazardous

or toxic according to the Resource Conservation and Recovery Act (RCRA),

Biogenic carbon is included in reported results.

Subtitle C are present in the products. Therefore, these criteria have been met.

primary resource (energy) usage, 1% nonrenewable primary resource (energy)

The precision of the data is considered high. W. R. MEADOWS personnel provided a detailed bill of materials, and facility managers provided utility information for the manufacturing facility. The raw material transportation distances were provided directly by the facility. The data included is considered complete. The LCA model included all known

material and energy flows. As pointed out in that section, no known flows above 1% were excluded and the sum of all excluded flows totals less than 5%, whether evaluated by mass, energy, or potential environmental impact.

The consistency of the model is considered high. Furthermore, the modeling

assumptions were consistent throughout the model, with a preference for the

Major system boundary exclusions Manufacture and transport of packaging not associated with final product

ecoinvent v3.10 database.

LMP (Cartersville, GA)

Parameter **LCIA** results

GWP,  $IPCC_{TOTAL}$ 

GWP, IPCC<sub>BIOGENIC</sub>

GWP, IPCC<sub>FOSSIL</sub>

GWP, TRACI 2.1<sub>TOTAL</sub>

GWP, TRACI 2.1<sub>BIOGENIC</sub>

Resource use indicators

as material

carrier (fuel)

content

used as material

Secondary materials

Renewable primary energy used as energy carrier (fuel)

Renewable primary resources with energy content used

Total use of renewable primary resources with energy

Non-renewable primary resources used as an energy

Non-renewable primary resources with energy content

Total use of non-renewable primary resources with energy

GWP, TRACI 2.1<sub>FOSSIL</sub>

Ozone depletion

Acidification

Construction of major capital equipment

Human labor and employee transport

Maintenance and operation of support equipment

LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit (1m2) of AIR-SHIELD™

kg CO<sub>2</sub> eq

kg CO₂ eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg CO<sub>2</sub> eq

kg SO<sub>2</sub> eq

kg CFC-11 eq

• Disposal of final product, except for biogenic carbon balance reporting

Product name

for as biogenic carbon emissions in the installation stage (A5).

AIR-SHIELD LMP 4.94E-02 kg CO<sub>2</sub> AIR-SHIELD LSR 3.55E-04 kg CO<sub>2</sub> AIR-SHIELD TMP 3.55E-04 kg CO<sub>2</sub>

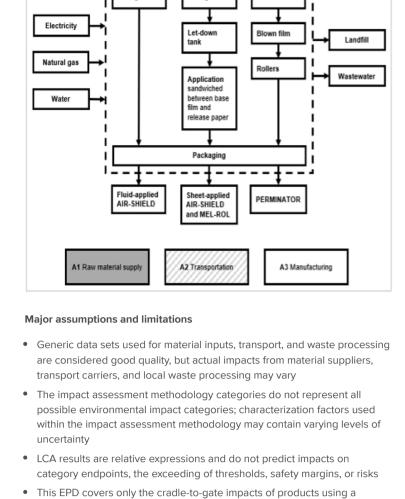
installation are out of the scope of this cradle-to-gate study, ISO 21930:2017

of after product installation are separately reported. The biogenic carbon

requires that biogenic carbon emissions associated with packaging disposed

removals from packaging in the manufacturing stage (A3) are later accounted

| Flow diagram |                  |                |     |   |
|--------------|------------------|----------------|-----|---|
|              |                  | Raw materials  |     |   |
|              |                  | Transportation | //) |   |
|              | Plant operations |                |     | ] |



1.10E-01

1.10E-01

1.09E-01

1.09E-01

1.68E-09

0

0

between products.

3.09E+00

-1.20E-04

3.09E+00

3.01E+00

-1.20E-04

3.01E+00

1.05E-07

6.19E-01

1.20E-04

6.19E-01

6.68E-01

1.20E-04

6.68E-01

1.01E-08

3.82E+00

3.82E+00

3.79E+00

3.79E+00

1.17E-07

0

0

declared unit. The results listed in this EPD cannot be used to compare

 $\ensuremath{\mathsf{LCIA}}$  impact factors required by the PCR are global warming, ozone depletion potential, acidification, eutrophication, smog, and fossil fuel depletion. The EPDs from different programs shall not be comparable.

1.29E-04 2.31E-03 1.23E-02 9.82E-03 9.43E-06 3.31E-04 2.55E-03 1.98E-03 3.85E-02 1.73E-01

Eutrophication 2.21E-03 kg N eq Smog kg O₃ eq 1.32E-01 2.15E-03 Respiratory effects kg PM2.5 eq 1.62E-03 3.38E-05 4.94E-04 Additional environmental information CTUh 55.88% 43.39% 100% 0.73% Carcinogenics Non-carcinogenics CTUh 62.85% 7.01% 30.14% 100% 100% **Ecotoxicity** CTUe 66.85% 8.12% 25.03% Fossil fuel depletion 1.04E+01 2.07E-01 9.95E-01 1.16E+01 MJ surplus Resource use indicators MJ, NCV 1.42E+00 2.39E-03 1.71E+01 1.85E+01 Renewable primary energy used as energy carrier (fuel) Renewable primary resources with energy content used MJ, NCV 4.08E-02 0 0 4.08E-02 as material Total use of renewable primary resources with energy MJ, NCV 1.85E+01 1.46E+00 2.39E-03 1.71E+01 content Non-renewable primary resources used as an energy MJ, NCV 6.96E+01 1.56E+00 1.06E+01 8.17E+01 carrier (fuel) Non-renewable primary resources with energy content MJ, NCV 1.73E+01 0 1.73E+01 Total use of non-renewable primary resources with energy MJ, NCV 8.69E+01 1.56E+00 1.06E+01 9.90E+01 content Secondary materials 0 0 0 0 kg 0 0 0 0 Renewable secondary fuels MJ, NCV 0 0 0 0 Non-renewable secondary fuels MJ, NCV 0 Recovered energy MJ, NCV 0 0 0 Use of net fresh water resources m3 4.43E+00 7.65E-03 7.42E-01 5.18E+00 Abiotic depletion (fossil fuels) MJ, LHV 7.94E+01 1.47E+00 9.31E+00 9.01E+01 Output flows and waste category indicators 5.54E-02 3.31E-04 1.10E-02 6.68E-02 Hazardous waste disposed kg 1.35E-03 1.08E-03 2.43E-03 Non-hazardous waste disposed kg 1.34E-06 High-level radioactive waste, conditioned, to final 6.78E-06 kg 1.75E-08 9.53E-07 7.76E-06 repository Intermediate- and low-level radioactive waste, 3.43E-08 1.55E-05 5.11E-06 2.07E-05 kg conditioned, to final repository 0 0 Components for re-use kg 0 0 0 0 Materials for recycling kg 0 0 Materials for energy recovery kg 0 0 0 0 MJ 0 0 0 Exported energy 0 Carbon emissions and removals Biogenic carbon removal from product kg CO<sub>2</sub> 0 0 0 0 0 0 0 0 Biogenic carbon emission from product kg CO<sub>2</sub> Biogenic carbon removal from packaging -1.20E-04 -4.94E-02 kg CO<sub>2</sub> 0 -4.95E-02 1.20E-04 Biogenic carbon emission from packaging 1.20E-04 kg CO<sub>2</sub> 0 0 Biogenic carbon emission from combustion of waste from kg CO<sub>2</sub> renewable sources used in production processes Calcination carbon emissions kg CO<sub>2</sub> 0 0 0 Carbonation carbon removals kg CO<sub>2</sub> 0 Carbon emissions from combustion of waste from non-0 0 0 0 kg CO<sub>2</sub> renewable sources used in production processes LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit (1m2) of AIR-SHIELD™ LMP (Forth Worth, TX) **LCIA** results 1.92E-01 GWP,  $IPCC_{TOTAL}$ kg CO₂ eq 3.09E+00 6.06E-01 3.89E+00 kg CO<sub>2</sub> eq GWP, IPCC<sub>BIOGENIC</sub> -1.20E-04 0 1.20E-04 0 GWP, IPCC<sub>FOSSIL</sub> 3.09E+00 1.92E-01 3.89E+00 kg CO<sub>2</sub> eq 6.06E-01 GWP, TRACI 2.1<sub>TOTAL</sub> kg CO<sub>2</sub> eq 3.01E+00 1.90E-01 6.56E-01 3.86E+00 GWP, TRACI 2.1<sub>BIOGENIC</sub> kg CO<sub>2</sub> eq -1.20E-04 0 1.20E-04 0 1.90E-01 3.86E+00 GWP, TRACI 2.1<sub>FOSSIL</sub> kg CO<sub>2</sub> eq 3.01E+00 6.56E-01 Ozone depletion kg CFC-11 eq 1.05E-07 2.94E-09 9.26E-09 1.17E-07 Acidification kg SO<sub>2</sub> eq 9.82E-03 2.25E-04 2.28E-03 1.23E-02 2.55E-03 Eutrophication 2.21E-03 1.65E-05 3.27E-04 kg N eq 3.47E-03 3.81E-02 1.74E-01 Smog kg O₃ eq 1.32E-01 Respiratory effects kg PM2.5 eq 1.62E-03 5.91E-05 4.91E-04 2.17E-03 Additional environmental information 100% Carcinogenics CTUh 55.70% 1.27% 43.02% CTUh 59.97% 11.70% 100% Non-carcinogenics 28.33% Ecotoxicity CTUe 63.05% 13.38% 23.57% 100% 1.04E+01 9.78E-01 Fossil fuel depletion MJ surplus 3.62E-01 1.18E+01

1.38E+00

4.08E-02

1.42E+00

6.96E+01

1.73E+01

8.69E+01

4.18E-03

4.18E-03

2.73E+00

2.73E+00

0

1.71E+01

1.71E+01

1.02E+01

1.02E+01

1.85E+01

4.08E-02

1.85E+01

8.25E+01

1.73E+01

9.98E+01

MJ, NCV

MJ, NCV

MJ, NCV

MJ, NCV

MJ, NCV

MJ, NCV

| Secondary materials   | kg                    | 0               | 0                 | 0                  | 0           |
|---|-----------------------|-----------------|-------------------|--------------------|-------------|
| Renewable secondary fuels   | MJ, NCV               | 0               | 0                 | 0                  | 0           |
| Non-renewable secondary fuels   | MJ, NCV               | 0               | 0                 | 0                  | 0           |
| Recovered energy  | MJ, NCV               | 0               | 0                 | 0                  | 0           |
| Use of net fresh water resources  | m3                    | 4.43E+00        | 1.34E-02          | 6.20E-01           | 5.06E+00    |
| Abiotic depletion (fossil fuels)  | MJ, LHV               | 7.94E+01        | 2.56E+00          | 9.16E+00           | 9.11E+01    |
| Output flows and waste category indicators  |                       |                 |                   |                    |             |
| Hazardous waste disposed  | kg                    | 5.54E-02        | 5.79E-04          | 1.10E-02           | 6.70E-02    |
| Non-hazardous waste disposed  | kg                    | 1.35E-03        | 2.34E-06          | 1.07E-03           | 2.42E-03    |
| High-level radioactive waste, conditioned, to final repository  | kg                    | 6.80E-06        | 3.06E-08          | 9.54E-07           | 7.78E-06    |
| Intermediate- and low-level radioactive waste, conditioned, to final repository                       | kg                    | 1.61E-05        | 5.99E-08          | 3.43E-06           | 1.96E-05    |
| Components for re-use   | kg                    | 0               | 0                 | 0                  | 0           |
| Materials for recycling   | kg                    | 0               | 0                 | 0                  | 0           |
| Materials for energy recovery   | kg                    | 0               | 0                 | 0                  | 0           |
| Exported energy   | MJ                    | 0               | 0                 | 0                  | 0           |
| Carbon emissions and removals   |                       |                 |                   |                    |             |
| Biogenic carbon removal from product  | kg CO <sub>2</sub>    | 0               | 0                 | 0                  | 0           |
| Biogenic carbon emission from product   | kg CO <sub>2</sub>    | 0               | 0                 | 0                  | 0           |
| Biogenic carbon removal from packaging  | kg CO <sub>2</sub>    | -1.20E-04       | 0                 | -4.94E-02          | -4.95E-02   |
| Biogenic carbon emission from packaging   | kg CO <sub>2</sub>    | 0               | 0                 | 1.20E-04           | 1.20E-04    |
| Biogenic carbon emission from combustion of waste from renewable sources used in production processes | kg CO <sub>2</sub>    | 0               | 0                 | 0                  | 0           |
| Calcination carbon emissions  | kg CO <sub>2</sub>    | 0               | 0                 | 0                  | 0           |
| Carbonation carbon removals   | kg CO <sub>2</sub>    | 0               | 0                 | 0                  | 0           |
| Carbon emissions from combustion of waste from non-<br>renewable sources used in production processes | kg CO <sub>2</sub>    | 0               | 0                 | 0                  | 0           |
| LCIA results, resource use, output and waste flow LMP (Hampshire, IL)                                 | ws, and carbon e      | missions & remo | ovals per declare | ed unit (1m2) of A | AIR-SHIELD™ |
| Parameter   | Unit                  | A1              | A2                | А3                 | Total       |
| LCIA results  |                       |                 |                   |                    |             |
| GWP, IPCC <sub>TOTAL</sub>  | kg CO <sub>2</sub> eq | 3.09E+00        | 2.41E-01          | 6.47E-01           | 3.98E+00    |

| GWP, IPCC <sub>BIOGENIC</sub>  | kg CO <sub>2</sub> eq | -1.20E-04 | 0        | 1.20E-04 | 0        |
|--|-----------------------|-----------|----------|----------|----------|
| GWP, IPCC <sub>FOSSIL</sub>  | kg CO <sub>2</sub> eq | 3.09E+00  | 2.41E-01 | 6.46E-01 | 3.98E+00 |
| GWP, TRACI 2.1 <sub>TOTAL</sub>                                      | kg CO <sub>2</sub> eq | 3.01E+00  | 2.38E-01 | 6.96E-01 | 3.95E+00 |
| GWP, TRACI 2.1 <sub>BIOGENIC</sub>                                   | kg CO <sub>2</sub> eq | -1.20E-04 | 0        | 1.20E-04 | 0        |
| GWP, TRACI 2.1 <sub>FOSSIL</sub>                                     | kg CO <sub>2</sub> eq | 3.01E+00  | 2.38E-01 | 6.95E-01 | 3.95E+00 |
| Ozone depletion  | kg CFC-11 eq          | 1.05E-07  | 3.70E-09 | 1.27E-08 | 1.21E-07 |
| Acidification  | kg SO <sub>2</sub> eq | 9.82E-03  | 2.83E-04 | 2.55E-03 | 1.27E-02 |
| Eutrophication   | kg N eq               | 2.21E-03  | 2.07E-05 | 3.48E-04 | 2.58E-03 |
| Smog   | kg O <sub>3</sub> eq  | 1.32E-01  | 4.35E-03 | 4.02E-02 | 1.77E-01 |
| Respiratory effects  | kg PM2.5 eq           | 1.62E-03  | 7.42E-05 | 5.07E-04 | 2.20E-03 |
| Additional environmental information                                 |                       |           |          |          |          |
| Carcinogenics  | CTUh                  | 54.68%    | 1.57%    | 43.75%   | 100%     |
| Non-carcinogenics  | CTUh                  | 57.65%    | 14.13%   | 28.22%   | 100%     |
| Ecotoxicity  | CTUe                  | 60.88%    | 16.23%   | 22.89%   | 100%     |
| Fossil fuel depletion  | MJ surplus            | 1.04E+01  | 4.55E-01 | 9.88E-01 | 1.19E+01 |
| Resource use indicators  |                       |           |          |          |          |
| Renewable primary energy used as energy carrier (fuel)               | MJ, NCV               | 1.38E+00  | 5.25E-03 | 1.71E+01 | 1.84E+01 |
| Renewable primary resources with energy content used as material     | MJ, NCV               | 4.08E-02  | 0        | 0        | 4.08E-02 |
| Total use of renewable primary resources with energy content         | MJ, NCV               | 1.42E+00  | 5.25E-03 | 1.71E+01 | 1.85E+01 |
| Non-renewable primary resources used as an energy carrier (fuel)     | MJ, NCV               | 6.96E+01  | 3.43E+00 | 1.11E+O1 | 8.41E+01 |
| Non-renewable primary resources with energy content used as material | MJ, NCV               | 1.73E+01  | 0        | 0        | 1.73E+01 |
| Total use of non-renewable primary resources with energy content     | MJ, NCV               | 8.69E+01  | 3.43E+00 | 1.11E+O1 | 1.01E+02 |
| Secondary materials  | kg                    | 0         | 0        | 0        | 0        |
| Renewable secondary fuels  | MJ, NCV               | 0         | 0        | 0        | 0        |
| Non-renewable secondary fuels  | MJ, NCV               | 0         | 0        | 0        | 0        |

| Output flows and waste category indicators   | m3<br>MJ, LHV   | 4.43E+00<br>7.94E+01              | 1.68E-02<br>3.22E+00             | 6.75E-01<br>9.55E+00             | 5.12E+00<br>9.21E+01                  |
|--|---|-----------------------------------|----------------------------------|----------------------------------|---------------------------------------|
| Hazardous waste disposed  Non-hazardous waste disposed   | kg<br>kg  | 5.54E-02<br>1.13E-01              | 7.27E-04<br>0                    | 1.10E-02<br>8.05E-01             | 6.72E-02<br>9.19E-01                  |
| High-level radioactive waste, conditioned, to final repository Intermediate- and low-level radioactive waste,  | kg<br>kg  | 6.80E-06<br>1.61E-05              | 3.84E-08<br>7.52E-08             | 9.54E-07<br>8.11E-06             | 7.79E-06<br>2.42E-05                  |
| conditioned, to final repository  Components for re-use  Materials for recycling   | kg<br>kg  | 0                                 | 0                                | 0                                | 0                                     |
| Materials for energy recovery  Exported energy   | kg<br>MJ  | 0                                 | 0                                | 0                                | 0                                     |
| Carbon emissions and removals  Biogenic carbon removal from product  Biogenic carbon emission from product   | kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| Biogenic carbon removal from packaging Biogenic carbon emission from packaging   | kg CO <sub>2</sub>  | -1.20E-04<br>0                    | 0                                | -4.94E-02<br>1.20E-04            | -4.95E-02<br>1.20E-04                 |
| Biogenic carbon emission from combustion of waste from renewable sources used in production processes  Calcination carbon emissions  | kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| Carbonation carbon removals  Carbon emissions from combustion of waste from non-   | kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| CIA results, resource use, output and waste flo  |   |                                   |                                  |                                  |                                       |
| SR (Cartersville, GA)  Parameter   | Unit  | A1                                | A2                               | A3                               | Total                                 |
| LCIA results GWP, IPCC <sub>TOTAL</sub>  | kg CO₂ eq   | 5.26E+00                          | 1.29E-01                         | 6.29E-01                         | 6.02E+00                              |
| GWP, IPCC <sub>BIOGENIC</sub> GWP, IPCC <sub>FOSSIL</sub> GWP, TRACI 2.1 <sub>TOTAL</sub>  | $kg CO_2 eq$ $kg CO_2 eq$ $kg CO_2 eq$                                      | -5.72E-04<br>5.26E+00<br>5.11E+00 | 0<br>1.29E-01<br>1.27E-01        | 5.72E-04<br>6.28E-01<br>7.48E-01 | 0<br>6.02E+00<br>5.99E+00             |
| GWP, TRACI 2.1 <sub>BIOGENIC</sub> GWP, TRACI 2.1 <sub>FOSSIL</sub>  | $kg CO_2 eq$ $kg CO_2 eq$   | -1.20E-04<br>5.11E+00             | 0<br>1.27E-01                    | 1.20E-04<br>7.48E-01             | 0<br>5.99E+00                         |
| Ozone depletion  Acidification  Eutrophication   | kg CFC-11 eq<br>kg $SO_2$ eq<br>kg N eq                                     | 1.90E-07<br>1.49E-02<br>2.49E-03  | 1.98E-09<br>1.51E-04<br>1.11E-05 | 3.62E-09<br>1.48E-03<br>2.74E-04 | 1.95E-07<br>1.66E-02<br>2.78E-03      |
| Smog<br>Respiratory effects  | $kg O_3 eq$ $kg PM2.5 eq$   | 1.99E-01<br>2.32E-03              | 2.33E-03<br>3.97E-05             | 2.24E-02<br>1.77E-04             | 2.24E-01<br>2.54E-03                  |
| Additional environmental information  Carcinogenics  | CTUh  | 51.30%                            | 0.61%                            | 48.10%                           | 100%                                  |
| Non-carcinogenics Ecotoxicity Fossil fuel depletion  | CTUh CTUe MJ surplus  | 73.30%<br>82.99%<br>1.97E+01      | 6.29%<br>6.60%<br>2.43E-01       | 20.42%<br>10.41%<br>4.57E-01     | 100%<br>100%<br>2.04E+01              |
| Resource use indicators  Renewable primary energy used as energy carrier (fuel)  | MJ, NCV   | 1.63E+00                          | 2.81E-03                         | 4.80E-01                         | 2.12E+00                              |
| Renewable primary resources with energy content used as material  Total use of renewable primary resources with energy   | MJ, NCV   | 4.08E-02<br>1.68E+00              | 0<br>2.81E-03                    | 0<br>4.80E-01                    | 4.08E-02<br>2.17E+00                  |
| content  Non-renewable primary resources used as an energy carrier (fuel)  | MJ, NCV   | 1.42E+02                          | 1.83E+00                         | 8.14E+00                         | 1.52E+02                              |
| Non-renewable primary resources with energy content used as material  Total use of non-renewable primary resources with energy   | MJ, NCV   | 1.73E+01<br>1.59E+02              | 0<br>1.83E+00                    | 0<br>8.14E+00                    | 1.73E+01<br>1.69E+02                  |
| content Secondary materials Renewable secondary fuels  | kg MJ, NCV  | 1.59E+02<br>0                     | 1.83E+00<br>0                    | 8.14E+00<br>0<br>0               | 1.69E+02<br>0                         |
| Renewable secondary fuels  Non-renewable secondary fuels  Recovered energy   | MJ, NCV<br>MJ, NCV  | 0 0                               | 0 0                              | 0 0                              | 0 0                                   |
| Use of net fresh water resources Abiotic depletion (fossil fuels)  | m3<br>MJ, LHV   | 6.12E+00<br>1.46E+02              | 8.98E-03<br>1.72E+00             | 4.47E-01<br>6.90E+00             | 6.57E+00<br>1.55E+02                  |
| Output flows and waste category indicators  Hazardous waste disposed  Non-hazardous waste disposed   | kg<br>kg  | 6.96E-02<br>2.21E+00              | 1.09E-03<br>4.40E-03             | 1.58E-03<br>6.40E-01             | 7.23E-02<br>2.86E+00                  |
| High-level radioactive waste, conditioned, to final repository   | kg  | 9.06E-06                          | 2.05E-08                         | 7.58E-07                         | 9.84E-06                              |
| Intermediate- and low-level radioactive waste, conditioned, to final repository  Components for re-use   | kg<br>kg  | 2.07E-05<br>0                     | 3.99E-08<br>0                    | 6.45E-06<br>0                    | 2.72E-05<br>0                         |
| Materials for recycling  Materials for energy recovery  Exported energy  | kg<br>kg  | 0                                 | 0                                | 0                                | 0                                     |
| Exported energy  Carbon emissions and removals  Biogenic carbon removal from product   | MJ<br>kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| Biogenic carbon emission from product Biogenic carbon removal from packaging   | kg CO <sub>2</sub>  | 0<br>-5.72E-04                    | 0                                | 0<br>-3.55E-04                   | 0<br>-9.27E-04                        |
| Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from renewable sources used in production processes  | kg CO <sub>2</sub>  | 0                                 | 0                                | 5.72E-04<br>0                    | 5.72E-04<br>0                         |
| Calcination carbon emissions  Carbonation carbon removals  | kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| Carbon emissions from combustion of waste from non-<br>renewable sources used in production processes  CIA results, resource use, output and waste flo   | kg CO <sub>2</sub>  | emissions & re                    | o<br>emovals per dec             | o                                | of AIR-SHIFL DT                       |
| SR (Forth Worth, TX)   |   |                                   |                                  |                                  |                                       |
| Parameter  LCIA results  GWP, IPCC <sub>TOTAL</sub>  | Unit  | 5.26E+00                          | <b>A2</b> 5.91E-01               | A3<br>6.22E-01                   | Total 6.48E+00                        |
| GWP, IPCC <sub>BIOGENIC</sub>  | kg CO <sub>2</sub> eq   | -5.72E-04<br>5.26E+00             | 0<br>5.91E-01                    | 5.72E-04<br>6.21E-01             | 0<br>6.48E+00                         |
| GWP, TRACI 2.1 <sub>TOTAL</sub> GWP, TRACI 2.1 <sub>BIOGENIC</sub> GWP, TRACI 2.1 <sub>FOSSIL</sub>  | $kg CO_2 eq$ $kg CO_2 eq$ $kg CO_2 eq$                                      | 5.11E+00<br>-1.20E-04<br>5.11E+00 | 5.84E-01<br>0<br>5.84E-01        | 7.42E-01<br>1.20E-04<br>7.41E-01 | 6.44E+00<br>0<br>6.44E+00             |
| Ozone depletion Acidification  | kg CFC-11 eq  | 1.90E-07<br>1.49E-02              | 9.06E-09<br>6.94E-04             | 2.81E-09<br>1.48E-03             | 2.01E-07<br>1.71E-02                  |
| Eutrophication Smog  | kg N eq<br>kg O₃ eq   | 2.49E-03<br>1.99E-01              | 5.07E-05<br>1.07E-02             | 2.71E-04<br>2.22E-02             | 2.81E-03<br>2.32E-01                  |
| Respiratory effects  Additional environmental information  Carcinogenics   | kg PM2.5 eq   | 2.32E-03<br>50.25%                | 1.82E-04<br>2.72%                | 1.74E-04<br>47.02%               | 2.68E-03                              |
| Non-carcinogenics<br>Ecotoxicity   | CTUh<br>CTUe  | 60.00%<br>67.13%                  | 23.59%<br>24.47%                 | 16.41%<br>8.40%                  | 100%<br>100%                          |
| Fossil fuel depletion  Resource use indicators   | MJ surplus  | 1.97E+01                          | 1.12E+00                         | 4.48E-01                         | 2.13E+01                              |
| Renewable primary energy used as energy carrier (fuel) Renewable primary resources with energy content used as material  | MJ, NCV   | 1.64E+00<br>4.08E-02              | 1.29E-02<br>0                    | 5.22E-01<br>0                    | 2.18E+00<br>4.08E-02                  |
| Total use of renewable primary resources with energy content  Non-renewable primary resources used as an energy  | MJ, NCV   | 1.68E+00                          | 1.29E-02                         | 5.22E-01<br>7.85E+00             | 2.22E+00                              |
| carrier (fuel)  Non-renewable primary resources with energy content  used as material  | MJ, NCV   | 1.42E+02<br>1.73E+01              | 8.40E+00<br>0                    | 0                                | 1.58E+02<br>1.73E+01                  |
| Total use of non-renewable primary resources with energy content Secondary materials   | MJ, NCV   | 1.59E+02                          | 8.40E+00<br>0                    | 7.85E+00                         | 1.76E+02                              |
| Renewable secondary fuels Non-renewable secondary fuels  | MJ, NCV   | 0                                 | 0                                | 0                                | 0                                     |
| Recovered energy  Use of net fresh water resources   | MJ, NCV<br>m3   | 0<br>6.12E+00                     | 0<br>4.12E-02                    | 0<br>2.90E-01                    | 0<br>6.45E+00                         |
| Abiotic depletion (fossil fuels)  Output flows and waste category indicators  Hazardous waste disposed   | MJ, LHV   | 1.46E+02<br>6.96E-02              | 7.89E+00<br>1.78E-03             | 6.82E+00<br>1.58E-03             | 1.61E+02<br>7.30E-02                  |
| Non-hazardous waste disposed High-level radioactive waste, conditioned, to final repository  | kg<br>kg  | 2.21E-03<br>9.06E-06              | 7.22E-06<br>9.42E-08             | 6.74E-04<br>7.58E-07             | 2.89E-03<br>9.91E-06                  |
| Intermediate- and low-level radioactive waste, conditioned, to final repository  | kg  | 2.07E-05                          | 1.83E-07                         | 4.52E-06                         | 2.54E-05                              |
| Components for re-use  Materials for recycling  Materials for energy recovery  | kg<br>kg<br>kg  | 0 0                               | 0 0                              | 0 0                              | 0 0                                   |
| Exported energy  Carbon emissions and removals   | MJ  | 0                                 | 0                                | 0                                | 0                                     |
| Biogenic carbon removal from product  Biogenic carbon emission from product  Biogenic carbon removal from packaging  | kg CO <sub>2</sub> kg CO <sub>2</sub>                                       | 0<br>0<br>-5.72E-04               | 0                                | 0<br>0<br>-3.55E-04              | 0<br>0<br>-9.27E-04                   |
| Biogenic carbon removal from packaging Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from  | kg CO <sub>2</sub> kg CO <sub>2</sub>                                       | -5.72E-04<br>0                    | 0 0                              | -3.55E-04<br>5.72E-04            | -9.27E-04<br>5.72E-04                 |
| renewable sources used in production processes  Calcination carbon emissions  Carbonation carbon removals  | kg CO <sub>2</sub> kg CO <sub>2</sub>                                       | 0                                 | 0 0                              | 0                                | 0 0                                   |
| Carbonation carbon removals  Carbon emissions from combustion of waste from non- renewable sources used in production processes  | kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| CIA results, resource use, output and waste flo<br>SR (Hampshire, IL)  | ws, and carbon  | emissions & re                    | emovals per dec                  | lared unit (1m2)                 | of AIR-SHIELDT                        |
| Parameter<br>LCIA results  | Unit  | A1                                | A2                               | А3                               | Total                                 |
| GWP, IPCC  | kg CO <sub>2</sub> eq   | 5.26E+00<br>-5.72E-04             | 3.61E-01                         | 6.22E-01<br>5.72E-04             | 6.25E+00<br>0                         |
| GWP, IPCC <sub>FOSSIL</sub> GWP, TRACI 2.1 <sub>TOTAL</sub> GWP, TRACI 2.1 <sub>BIOGENIC</sub>   | $kg CO_2 eq$ $kg CO_2 eq$ $kg CO_2 eq$                                      | 5.26E+00<br>5.11E+00<br>-1.20E-04 | 3.61E-01<br>3.57E-01<br>0        | 6.21E-01<br>7.42E-01<br>1.20E-04 | 6.25E+00<br>6.21E+00<br>0             |
| GWP, TRACI 2.1 <sub>FOSSIL</sub><br>Ozone depletion  | kg CO <sub>2</sub> eq   | 5.11E+00<br>1.90E-07              | 3.57E-01<br>5.53E-09             | 7.41E-01<br>2.81E-09             | 6.21E+00<br>1.98E-07                  |
| Acidification  Eutrophication  Smog  | $kg SO_2 eq$ $kg N eq$ $kg O_3 eq$  | 1.49E-02<br>2.49E-03<br>1.99E-01  | 4.23E-04<br>3.10E-05<br>6.51E-03 | 1.48E-03<br>2.67E-04<br>2.22E-02 | 1.68E-02<br>2.79E-03<br>2.28E-01      |
| Smog Respiratory effects  Additional environmental information   | kg O₃ eq<br>kg PM2.5 eq   | 1.99E-01<br>2.32E-03              | 6.51E-03<br>1.11E-04             | 1.74E-04                         | 2.28E-01<br>2.61E-03                  |
| Carcinogenics Non-carcinogenics  | CTUh<br>CTUh  | 50.80%<br>66.11%                  | 1.68%<br>15.86%                  | 47.52%<br>18.03%                 | 100%                                  |
| Ecotoxicity Fossil fuel depletion Resource use indicators  | CTUe<br>MJ surplus  | 74.21%<br>1.97E+01                | 16.51%<br>6.81E-01               | 9.28%<br>4.48E-01                | 100%<br>2.09E+01                      |
| Renewable primary energy used as energy carrier (fuel) Renewable primary resources with energy content used  | MJ, NCV   | 1.64E+00<br>4.08E-02              | 7.85E-03                         | 5.22E-01                         | 2.17E+00<br>4.08E-02                  |
| as material Total use of renewable primary resources with energy content   | MJ, NCV   | 1.68E+00                          | 7.85E-03                         | 5.22E-01                         | 2.21E+00                              |
| Non-renewable primary resources used as an energy carrier (fuel)  Non-renewable primary resources with energy content  | MJ, NCV   | 1.42E+02                          | 5.13E+00                         | 7.85E+00                         | 1.55E+02                              |
| used as material  Total use of non-renewable primary resources with energy content   | MJ, NCV  MJ, NCV  | 1.73E+01<br>1.59E+02              | 0<br>5.13E+00                    | 0<br>7.85E+00                    | 1.73E+01<br>1.72E+02                  |
| Secondary materials<br>Renewable secondary fuels   | kg<br>MJ, NCV   | 0                                 | 0                                | 0                                | 0                                     |
| Non-renewable secondary fuels Recovered energy Use of net fresh water resources  | MJ, NCV<br>MJ, NCV<br>m3  | 0<br>0<br>6.12E+00                | 0<br>0<br>2.51E-02               | 0<br>0<br>2.90E-01               | 0<br>0<br>6.43E+00                    |
| Use of net fresh water resources Abiotic depletion (fossil fuels)  Output flows and waste category indicators  | m3<br>MJ, LHV   | 6.12E+00<br>1.46E+02              | 2.51E-02<br>4.81E+00             | 2.90E-01<br>6.82E+00             | 6.43E+00<br>1.58E+02                  |
| Hazardous waste disposed<br>Non-hazardous waste disposed   | kg<br>kg  | 6.19E+01<br>4.27E-15              | 1.61E+00<br>0                    | 2.57E-01<br>1.28E+00             | 6.38E+01<br>1.28E+00                  |
| High-level radioactive waste, conditioned, to final repository Intermediate- and low-level radioactive waste,  | kg  | 9.06E-06<br>2.07E-05              | 5.75E-08                         | 7.58E-07                         | 9.88E-06<br>2.53E-05                  |
| conditioned, to final repository  Components for re-use  | kg<br>kg  | 2.07E-05<br>0                     | 1.12E-07<br>0<br>0               | 4.52E-06<br>0<br>0               | 2.53E-05<br>0<br>0                    |
| Materials for recycling Materials for energy recovery Exported energy  | kg<br>kg<br>MJ  | 0 0                               | 0 0                              | 0 0                              | 0 0                                   |
| Carbon emissions and removals Biogenic carbon removal from product   | kg CO <sub>2</sub>  | 0                                 | 0                                | 0                                | 0                                     |
| Diamonto   | kg CO <sub>2</sub> kg CO <sub>2</sub>                                       | 0<br>-5.72E-04<br>0               | 0 0                              | 0<br>-3.55E-04<br>5.72E-04       | 0<br>-9.27E-04<br>5.72E-04            |
| Biogenic carbon emission from product  Biogenic carbon removal from packaging  Biogenic carbon emission from packaging   |   | 0                                 | 0                                | 5.72E-04<br>0                    | 0                                     |
| Biogenic carbon removal from packaging Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from renewable sources used in production processes   | kg CO <sub>2</sub>  |                                   | -                                | _                                | 1 -                                   |
| Biogenic carbon removal from packaging Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from renewable sources used in production processes Calcination carbon emissions Carbonation carbon removals  | kg CO <sub>2</sub> kg CO <sub>2</sub>                                       | 0                                 | 0                                | 0                                | 0                                     |
| Biogenic carbon removal from packaging   | kg CO <sub>2</sub> kg CO <sub>2</sub> kg CO <sub>2</sub>                    | 0                                 | 0                                | 0                                | 0                                     |
| Biogenic carbon removal from packaging Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from renewable sources used in production processes Calcination carbon emissions Carbonation carbon removals Carbon emissions from combustion of waste from non-renewable sources used in production processes  | kg CO <sub>2</sub> kg CO <sub>2</sub> kg CO <sub>2</sub>                    | 0                                 | 0                                | 0                                | 0                                     |
| Biogenic carbon removal from packaging Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from renewable sources used in production processes Calcination carbon emissions Carbonation carbon removals Carbon emissions from combustion of waste from non-renewable sources used in production processes CIA results, resource use, output and waste flow MP (Cartersville, GA) | kg CO <sub>2</sub> kg CO <sub>2</sub> kg CO <sub>2</sub> kg CO <sub>2</sub> | 0<br>0<br>emissions & re          | 0<br>0<br>emovals per dec        | 0<br>0<br>lared unit (1m2)       | 0<br>0<br>of AIR-SHIELD <sup>TN</sup> |

GWP, TRACI 2.1<sub>EOSSII</sub> kg CO<sub>2</sub> eq 1.04E+00 8.56E-01 2.94E-02 1.52E-01 Ozone depletion kg CFC-11 eq 2.99E-08 4.56E-10 8.22E-10 3.11E-08 3.15E-03 Acidification kg SO<sub>2</sub> eq 2.79E-03 3.49E-05 3.20E-04 Eutrophication kg N eq 6.28E-04 2.56E-06 4.75E-05 6.78E-04 3.76E-02 5.38E-04 4.29E-02 kg O<sub>3</sub> eq 4.84E-03 Smoq 5.09E-04 9.16E-06 Respiratory effects kg PM2.5 eq 4.62E-04 3.83E-05 Additional environmental information CTUh 52.98% 0.66% 46.36% 100% Carcinogenics CTUh 100% Non-carcinogenics 70.71% 7.53% 21.76% Ecotoxicity **CTUe** 78.36% 9.06% 12.59% 100% 2.97E+00 5.62E-02 1.01E-01 3.12E+00 Fossil fuel depletion MJ surplus Resource use indicators 3.48E-01 1.97E-01 Renewable primary energy used as energy carrier (fuel) MJ, NCV 6.48E-04 5.46E-01 Renewable primary resources with energy content used MJ, NCV 0 0 0 0 as material Total use of renewable primary resources with energy MJ, NCV 3.48E-01 6.48E-04 1.97E-01 5.46E-01 content Non-renewable primary resources used as an energy MJ, NCV 1.89E+01 4.23E-01 1.76E+00 2.11E+01 carrier (fuel) Non-renewable primary resources with energy content MJ, NCV 4.92E+00 0 4.92E+00 Total use of non-renewable primary resources with energy MJ, NCV 2.38E+01 4.23E-01 1.76E+00 2.60E+01 content 0 Secondary materials 0 0 0 kg 0 0 0 0 Renewable secondary fuels MJ, NCV 0 0 0 0 Non-renewable secondary fuels MJ, NCV 0 Recovered energy 0 0 0 MJ, NCV Use of net fresh water resources m3 1.89E+00 3.08E-03 1.04E-01 2.00E+00 149F+00 2.36E+01 Abiotic depletion (fossil fuels) MJ. LHV 2.18E+01 3.98E-01 Output flows and waste category indicators Hazardous waste disposed kg 8.34E+00 1.33E-01 6.63E-02 8.54E+00 2 27F-13 0 Non-hazardous waste disposed kg 3.10E+02 3.10E+02 High-level radioactive waste, conditioned, to final 4 74F-09 kg 1.90E-06 1.57E-07 2.06E-06 repository Intermediate- and low-level radioactive waste, 4.31E-06 9.21E-09 1.61E-06 5.94E-06 kg conditioned, to final repository 0 0 Components for re-use kg 0 0 0 0 0 0 Materials for recycling kg Materials for energy recovery kg 0 0 0 0 Exported energy MJ 0 0 0 0 Carbon emissions and removals Biogenic carbon removal from product kg CO<sub>2</sub> 0 0 0 0 0 0 0 Biogenic carbon emission from product kg CO<sub>2</sub> -3.55E-04 -3.55E-04 Biogenic carbon removal from packaging kg CO<sub>2</sub> 0 0 0 0 Biogenic carbon emission from packaging kg CO<sub>2</sub> 0 0 Biogenic carbon emission from combustion of waste from 0 0 0 kg CO<sub>2</sub> 0 renewable sources used in production processes 0 0 0 Calcination carbon emissions kg CO<sub>2</sub> 0 Carbonation carbon removals kg CO<sub>2</sub> 0 0 0 0 Carbon emissions from combustion of waste from non-0 0 0 0 kg CO<sub>2</sub> renewable sources used in production processes LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit (1m2) of AIR-SHIELD™ TMP (Forth Worth, TX) Α2 LCIA results GWP, IPCC<sub>TOTAL</sub> 8.79E-01 5.41E-02 1.33E-01 1.07E+00 kg CO<sub>2</sub> eq GWP, IPCC<sub>BIOGENIC</sub> kg CO<sub>2</sub> eq 0 0 0 0 5.41E-02 GWP, IPCC<sub>FOSSI</sub> kg CO₂ eq 1.0 /E+00 GWP, TRACI 2.1<sub>TOTAL</sub> 8.56E-01 1.50E-01 5.35E-02 1.06E+00 kg CO<sub>2</sub> eq GWP, TRACI 2.1<sub>BIOGENIC</sub> kg CO<sub>2</sub> eq 0 0 0 0 GWP, TRACI 2.1<sub>FOSSIL</sub> kg CO<sub>2</sub> eq 8.56E-01 5.35E-02 1.50E-01 1.06E+00 Ozone depletion kg CFC-11 eq 2.99E-08 8.29E-10 6.44E-10 3.13E-08 Acidification kg SO<sub>2</sub> eq 2.79E-03 3.17E-03 6.35E-05 3.18E-04 Eutrophication 6.28E-04 4.64E-06 4.69E-05 6.80E-04 kg N eq kg O<sub>3</sub> eq 9.76E-04 4.78E-03 Smog 3.76E-02 4.33E-02 Respiratory effects kg PM2.5 eq 4.62E-04 1.66E-05 3.78E-05 5.16E-04 Additional environmental information Carcinogenics CTUh 52.74% 1.20% 46.06% 100% Non-carcinogenics 66.88% 20.19% 100% CTUh 12.94% **Ecotoxicity CTUe** 72.99% 15.32% 11.69% 100% 2.97E+00 1.02E-01 9.90E-02 3.17E+00 Fossil fuel depletion MJ surplus Resource use indicators 5.56E-01 Renewable primary energy used as energy carrier (fuel) MJ, NCV 3.48E-01 1.18E-03 2.07E-01 Renewable primary resources with energy content used MJ, NCV 0 as material Total use of renewable primary resources with energy MJ, NCV 3.48E-01 1.18E-03 2.07E-01 5.56E-01 content Non-renewable primary resources used as an energy 1.89E+01 7.69E-01 1.70E+00 2.14E+01 MJ, NCV carrier (fuel) Non-renewable primary resources with energy content 0 0 MJ, NCV 4.92E+00 4.92E+00 used as material Total use of non-renewable primary resources with energy 2.63E+01 MJ, NCV 2.38E+01 7.69E-01 1.70E+00 content Secondary materials kg MJ, NCV 0 0 0 0 Renewable secondary fuels 0 0 0 Non-renewable secondary fuels MJ, NCV 0 0 0 0 0 Recovered energy MJ, NCV 5.59E-03 6.94E-02 1.97E+00 Use of net fresh water resources 1.89E+00 m3 Abiotic depletion (fossil fuels) MJ, LHV 2.18E+01 7.22E-01 1.48E+00 2.40E+01 Output flows and waste category indicators Hazardous waste disposed kg 8.34E+00 2.42E-01 6.64E-02 8.65E+00 2.86E+02 Non-hazardous waste disposed kg 2.27E-13 2.86E+02 High-level radioactive waste, conditioned, to final kg 1.90E-06 8.62E-09 1.57E-07 2.06E-06 repository Intermediate- and low-level radioactive waste, 5.29E-06 4.31E-06 1.67E-08 9.59E-07 kg conditioned, to final repository kg 0 0 0 0 Components for re-use 0 0 0 Materials for recycling kg 0 0 0 0 Materials for energy recovery kg Exported energy MJ 0 0 0 0 Carbon emissions and removals 0 0 Biogenic carbon removal from product 0 0 kg CO<sub>2</sub> Biogenic carbon emission from product kg CO<sub>2</sub> 0 0 0 0 Biogenic carbon removal from packaging kg CO<sub>2</sub> 0 0 -3.55E-04 -3.55E-04 0 0 0 Biogenic carbon emission from packaging 0 kg CO<sub>2</sub> Biogenic carbon emission from combustion of waste from 0 kg CO<sub>2</sub> 0 0 0 renewable sources used in production processes Calcination carbon emissions kg CO<sub>2</sub> 0 0 0 0 0 0 0 0 kg CO<sub>2</sub> Carbonation carbon removals Carbon emissions from combustion of waste from non-0 0 0 kg CO<sub>2</sub> 0 renewable sources used in production processes LCIA results, resource use, output and waste flows, and carbon emissions & removals per declared unit (1m2) of AIR-SHIELD™ TMP (Hampshire, IL) **LCIA** results GWP,  $IPCC_{TOTAL}$ 1.36E-01 kg CO<sub>2</sub> eq 8.79E-01 7.83E-02 1.09E+00 GWP, IPCC<sub>BIOGENIC</sub> kg CO<sub>2</sub> eq 0 0 0 0 7.83E-02 GWP, IPCC<sub>FOSSIL</sub> 8.79E-01 1.36E-01 1.09E+00 kg CO<sub>2</sub> eq GWP, TRACI 2.1<sub>TOTAL</sub> 1.09E+00 8.56E-01 7.74E-02 1.53E-01 kg CO2 eq GWP, TRACI 2.1<sub>BIOGENIC</sub> kg CO<sub>2</sub> eq 0 0 0 GWP, TRACI 2.1<sub>FOSSIL</sub> 1.09E+00 kg CO<sub>2</sub> eq 8.56E-01 7.74E-02 1.53E-01 Ozone depletion kg CFC-11 eq 2.99E-08 1.20E-09 1.24E-09 3.23E-08 2.79E-03 3.57E-04 3.24E-03 Acidification 9.19E-05 kg SO<sub>2</sub> eq Eutrophication kg N eq 6.28E-04 6.72E-06 5.04E-05 6.86E-04 Smog kg O₃ eq 3.76E-02 1.41E-03 5.06E-03 4.40E-02 2.41E-05 Respiratory effects kg PM2.5 eq 4.00E-05 5.26E-04 4.62E-04 Additional environmental information Carcinogenics CTUh 52.07% 1.71% 46.21% 100% CTUh Non-carcinogenics 62.84% 17.60% 19.56% 100% CTUe 68.23% 20.74% 11.03% 100% **Ecotoxicity** Fossil fuel depletion 9.31F-02 3.21F+00 MJ surplus 2.97E+00 1.48E-01 Resource use indicators 5.36E-01 Renewable primary energy used as energy carrier (fuel) MJ, NCV 3.48E-01 1.71E-03 1.87E-01 Renewable primary resources with energy content used 0 0 0 0 MJ, NCV as material Total use of renewable primary resources with energy 3.48E-01 5.36E-01 MJ, NCV 1.71E-03 1.87E-01 content Non-renewable primary resources used as an energy MJ, NCV 1.11E+00 2.18E+01 1.89E+01 1.80E+00 carrier (fuel) Non-renewable primary resources with energy content MJ, NCV 4.92E+00 0 4.92E+00 used as material Total use of non-renewable primary resources with energy 2.38E+01 MJ, NCV 1.11E+00 1.80E+00 2.67E+01 0 0 0 Secondary materials kg 0 0 0 0 Renewable secondary fuels MJ, NCV 0 Non-renewable secondary fuels MJ, NCV 0 0 0 0 0 0 Recovered energy MJ, NCV 0 0 1.89E+00 Use of net fresh water resources m3 8.10E-03 7.99E-02 1.98E+00 Abiotic depletion (fossil fuels) MJ, LHV 2.18E+01 1.05E+00 1.49E+00 2.43E+01 Output flows and waste category indicators 8.34E+00 3.50E-01 6.67E-02 8.76E+00 Hazardous waste disposed kg 1.71E+02 Non-hazardous waste disposed kg 2.27E-13 0 1.71E+02 High-level radioactive waste, conditioned, to final 2.07E-06 1.90E-06 1.25E-08 1.57E-07 kg repository Intermediate- and low-level radioactive waste, 4.31E-06 2.42E-08 1.80E-06 6.13E-06 kg conditioned, to final repository 0 0 0 0 Components for re-use kg kg 0 0 0 0 Materials for recycling Materials for energy recovery 0 0 0 0 kg Exported energy MJ 0 0 0 0 Carbon emissions and removals 0 0 0 0 Biogenic carbon removal from product kg CO<sub>2</sub> 0 0 0 0 Biogenic carbon emission from product kg CO<sub>2</sub> -3.55E-04 Biogenic carbon removal from packaging kg CO<sub>2</sub> 0 0 -3.55E-04 Biogenic carbon emission from packaging 0 0 0 0 kg CO<sub>2</sub> Biogenic carbon emission from combustion of waste from 0 0 0 0 kg CO<sub>2</sub> renewable sources used in production processes Calcination carbon emissions kg CO<sub>2</sub> 0 0 0 0 0 0 Carbonation carbon removals kg CO<sub>2</sub> 0 0 Carbon emissions from combustion of waste from non-0 kg CO<sub>2</sub> 0 0 0 renewable sources used in production processes SM Transparency Report (EPD)™ LCA **SUMMARY EPD** W.R. MEADOWS, Inc. This Environmental Product Reference PCR 300 Industrial Drive ASTM PCR for Water-Resistive and 3rd-party reviewed Declaration (EPD) was externally P.O. Box 338 verified by Lindita Bushi, PhD, Hampshire, IL 60140-0338 Transparency Report (EPD) Senior Research Associate at Regions: system boundaries Athena, in accordance with ISO (800) 342-5976 3rd-party verified North America: Cradle-to-gate 21930:2017, ASTM International. **Declared unit:** 1 m<sup>2</sup> (2023). Product Category Rules Validity: 03/xx/25 - 03/xx/30 Contact us (PCR) for Preparing an LCIA methodology: TRACI 2.1 SM-WRM - 03xx2025 - 001 **Environmental Product Declaration** LCA software: LCI database (EPD) for Water-Resistive and Air SimaPro Developer 9.6; ecoinvent Barriers as well as ISO 14025:2006. v3.10. US-EI 2.2 Athena Sustainable Materials Public LCA: Institute 600 Grings Hill Road Sinking Spring, PA 19608 In accordance with ISO 14044 and the reference PCR, this life cycle (610) 985-0933 assessment was conducted by Sustainable Minds and reviewed by **Athena** Lindita Bushi, PhD, Senior Research Associate, at Athena. **Institute** © 2025 | The SM Transparency Report [EPD]™ Program is operated by Sustainable Minds® (www.sustainableminds.com) | Privacy policy

AIR-SHIELD™ LMP, LSR, TMP

# How we make it greener

Sustainable Minds:

nsparency Report (EPD)

Expand all

# RAW MATERIALS ACQUISITION

W. R. MEADOWS sources many materials domestically. Sourcing materials locally is more sustainable and results in a smaller carbon footprint for several reasons. It reduces transportation emissions by avoiding long-distance and overseas shipping, cutting fuel use and greenhouse gas output.

Supporting domestic industries strengthens local economies and promotes sustainable practices, reducing reliance on global supply chains. Local sourcing ensures efficient logistics, as materials are transported over shorter distances, saving energy in storage and transit. Finally, it eliminates dependence on energy-intensive transport modes like cargo ships and planes, which consume large amounts of fossil fuels. Domestic sourcing supports the environment and creates more resilient, eco-friendly supply chains.



## TRANSPORATION

## W. R. MEADOWS manufactures in the USA.

Sourcing materials domestically can be more sustainable and result in a lower carbon footprint for several reasons:

- Reduced transportation emissions: Local sourcing eliminates the need for long-distance shipping, especially overseas transport, significantly reducing fuel consumption and greenhouse gas emissions.
- Support for local economies: Buying domestically strengthens local industries, encourages more sustainable practices, and reduces dependence on global supply chains.
- Efficient logistics: With materials sourced nearby, transportation and delivery are quicker and more efficient, requiring less energy for storage and transit.
- Improved quality control: Local suppliers are often easier to monitor, ensuring higher standards for sustainability practices in production.
- Lower reliance on energy-intensive transport modes: Overseas sourcing often depends on cargo ships and planes, which consume vast amounts of fossil fuels compared to domestic transportation.
- In short, domestic sourcing benefits the environment and helps create more resilient and eco-conscious supply chains



# MANUFACTURING

## W. R. MEADOWS utilizes Continuous Improvement in its daily standard work for all manufacturing activities.

Front-line supervisors are the champions of OEE (Overall Equipment Effectiveness), which plays a crucial role in reducing energy consumption in manufacturing. It highlights any inefficiencies and directs our efforts to minimize unnecessary energy use. By closely monitoring equipment performance, OEE identifies periods of downtime, slow speeds, and quality defects, which can all lead to wasted energy. Moreover, OEE-driven improvements have led Meadows to more streamlined processes, better scheduling, and reduced machine wear, all of which contribute to lower energy costs and a more sustainable operation. This proactive approach not only decreases energy consumption but also helps manufacturers meet environmental goals and reduce their carbon footprint.

Further, OEE has helped Meadows to identify and reduce scrap by providing insights into equipment performance, highlighting areas where defects or inefficiencies occur during production. With improved equipment efficiency and fewer production delays, OEE ensures that processes run optimally, resulting in fewer errors and reduced waste. Ultimately, this leads to a higher-quality product with less material being wasted during the manufacturing process.



# USE & END OF LIFE

We understand the importance of end-of-life disposal. However, these products are meant to remain permanently adhered to their substrates, making them challenging to remove. As a result, they are typically landfilled during deconstruction or demolition.





# SM Transparency Report (EPD)™

LCA 3rd-party reviewed

Transparency Report (EPD)

Validity: 03/xx/25 - 03/xx/30 SM-WRM - 03xx2025 - 001

3rd-party verified

This Environmental Product Declaration (EPD) was externally verified by Lindita Bushi, PhD, Senior Research Associate at Athena, in accordance with ISO 21930:2017, ASTM International. (2023). Product Category Rules (PCR) for Preparing an **Environmental Product Declaration** (EPD) for Water-Resistive and Air Barriers as well as ISO 14025:2006.

Athena Sustainable Materials Institute 600 Grings Hill Road Sinking Spring, PA 19608

> **Athena** Institute

# **SUMMARY**

# Reference PCR

Regions; system boundaries North America; Cradle-to-gate

Declared unit: 1 m<sup>2</sup>

LCIA methodology: TRACI 2.1

LCA software; LCI database SimaPro Developer 9.6; ecoinvent v3.10, US-EI 2.2

# Public LCA:

LCA of W. R. MEADOWS Water-Resistive and Air Barriers

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and reviewed by Lindita Bushi, PhD, Senior Research Associate, at Athena.

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