Environmental Product Declaration

dHive

ARCHITECTURAL SOLUTIONS

dHive is an innovative architectural wall system that enables sustainable design, superior acoustic performance, facilitated processes while maintaining a beautiful aesthetic

Dynamic Hive is a US-based manufacturer providing architects and designers innovative environmental solutions.

The process of designing a new workspace is truly a creative journey. Through minimalistic design, dHive provides a wide spectrum of sustainable solutions, each tailored to fit the needs of a variety of end-users.

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ASTM INTERNATIONAL
www.astm.org

Date of certification: Dec. 18, 2023
Period of validity: 5 years

The functional unit is one square meter of workspace for a period of 10 years, and 1 unit of the product is needed to meet the functional unit requirement per the PCR.

This EPD was not written to support comparative assertions. EPDs based on different PCRs or different calculation models may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results due to and not limited to the practitioner’s assumptions, the source of the data used in the study and the software tool used to conduct the study.

Environmental Product Declaration

dHive
Architectural Solutions

According to ISO 14025, ISO 14040, and ISO 14044

EPD Program and Program Operator Name, Address, Logo, and Website	ASTM International – www.astm.org 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428
General Program Instructions and Version Number	ASTM General Program Instructions. V.8.0, April 29, 2020
Manufacturer Name and Address	Dynamic Hive, 10001 Windstream Dr, Columbia, MD; USA
Declaration Number	EPD 409 – Dynamic Hive Architectural Solutions
Product Category	Panels for division of space
Declared Product & Functional Unit or Declared Unit	dHive glass panel system covering one square meter of floorspace for a period of 10 years
Reference PCR and Version Number	BIFMA PCR for Office Furniture Workspace Products: UNCPC 3814
Description of Product Application/Use	Architectural solutions for division of space
Product RSL	10 years
Markets of Applicability	North America
Date of Issue	Dec. 18, 2023
Period of Validity	5 years
EPD Type	Product Specific
EPD Scope	Cradle-to-grave
Year of Reported Rrimary Data	2020
LCA Software & Version Number	SimaPro v. 9.3.0.3
LCI Database(s) & Version Number	Ecoinvent 3.8 DATASMART LCI Package (USEI 2.2 v. 2021.1)
LCIA Methodology & Version Number	IPCC 100a v1.06, TRACI 2.1,

The PCR review was conducted by:	ASTM International
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Name: Tim Brooke Organization: ASTM International
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	TrueNorth Collective Consultiing
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Name: Anna Lasso Organization: Nicholson Consulting

LIMITATIONS
The PCR this EPD was based on was written to determine the potential environmental impacts of a furniture workspace product from cradle-to-grave. It was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

1. Product Definition and Information

1.1. Description of Company/Organization

Dynamic Hive is a US-based manufacturer with over two decades of experience providing architects and designers innovative environmental solutions.

1.2. Product Description

Product Identification

dHive is an innovative architectural wall system that consist of panels for division of space that go from floor to ceiling and provides superior acoustic performance while maintaining a beautiful aesthetic. dHive is built on the promise that design with substance can turn professional environments into more beautiful, efficient, and empowering spaces. Offered solutions range from single glass to double glass and solid panels and doors, and it can be configured to provide unique, work area delineation. This EPD represents the average of over 20 projects installed in 2020 where floor space ranged from 74 – 12,700 square meters and occupancy ranged from 6 – 528 people. The average used for this EPD is 2,690 square meters of physical floor space and the average occupancy of 112.

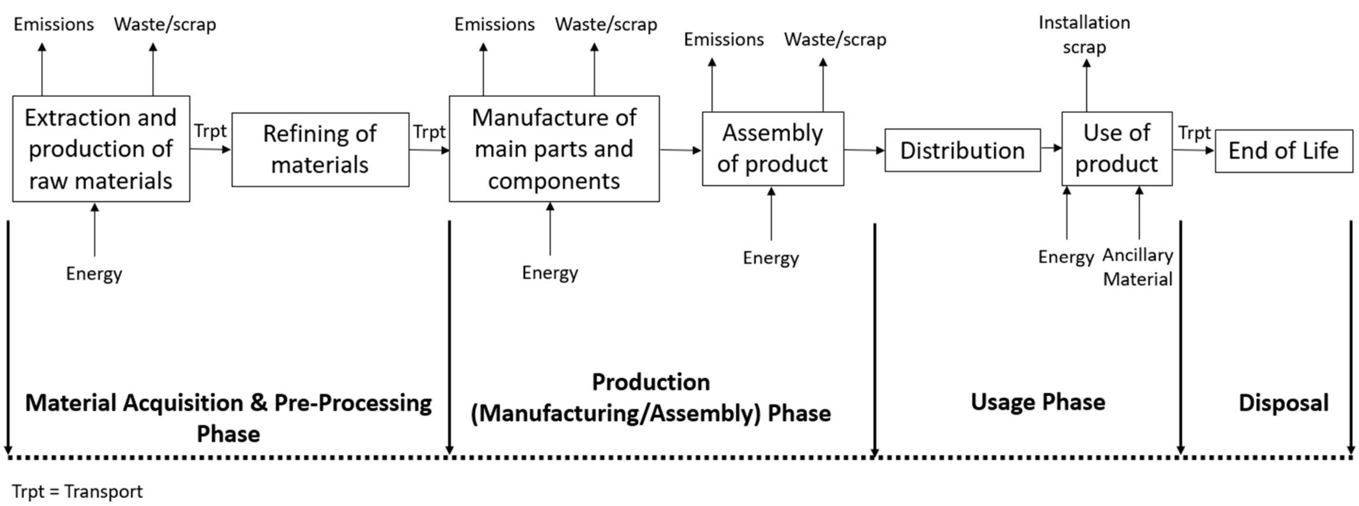

Figure 1 Flow diagram

1.3. Material Acquisition & Pre-Processing Phase

The referenced projects from 2020 varied greatly in configuration and size, and the range in their percent contribution by material weight can be seen below. The baseline for this EPD is their average, and it consists of 0.30 kg of aluminum per square meter (16%), 1.50 kg of glass per square meter (82%), and 0.03 kg of miscellaneous hardware per square meter (2%) of floorspace covered.

Table 1 Material composition by weight

MATERIAL	FUNCTION	QUANTITY (% BY WEIGHT)
Glass	Transparent panels	68-87
Aluminum	Support and mounting	12-30
Balance	Miscellaneous Hardware	1-5

1.4. Production (Manufacturing/Assembly) Phase

Except for the uncoated glass, Dynamic Hive manufacturing facility receives all components and anodized aluminum necessary for project installation. The anodized aluminum is drilled and cut to proper length for the project site, and all project materials are assembled and shipped to the project site with reusable packaging that consists of wood crates and corrugate.

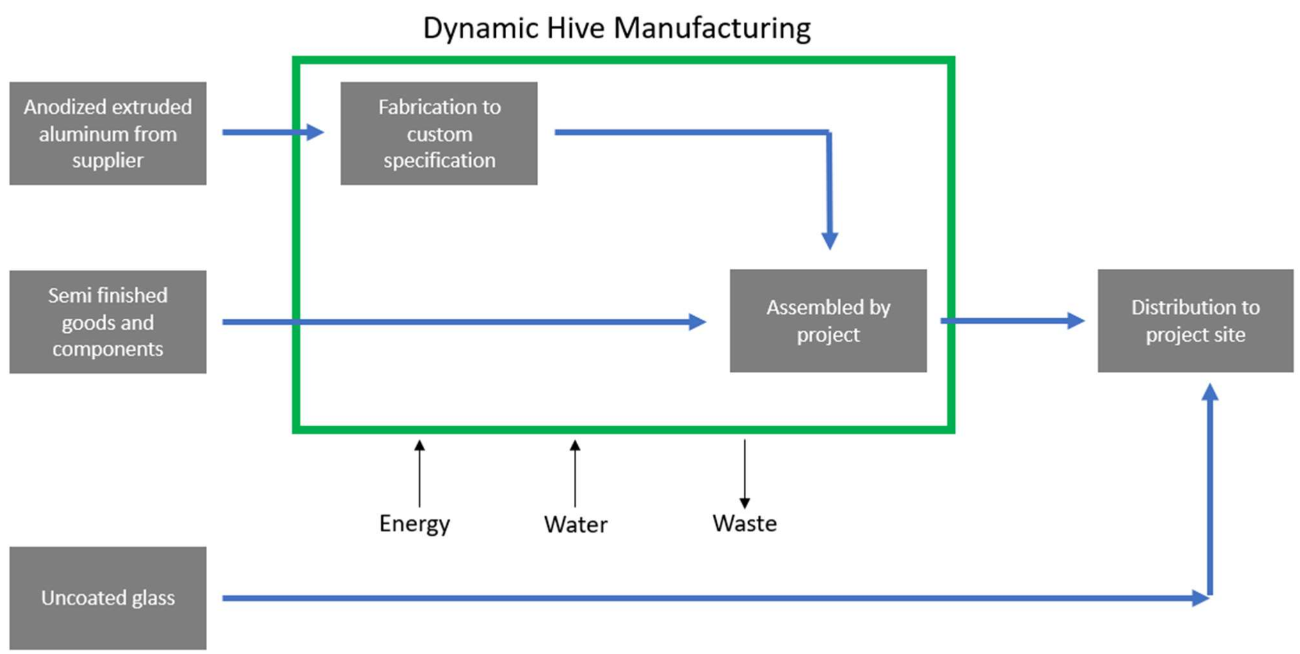

Figure 2 Process map

1.5. Usage Phase

After installation, the dHive product is assumed to have a minimum service life of 10 years, and it does not require any maintenance or care & cleaning. It also does not utilize any water or energy, so transportation to the end-of-life are the only impacts during use phase.

1.6. Disposal

The aluminum and glass materials that make up a vast majority of the dHive product are recyclable, and the assumed recycling rates of the materials were obtained from USEPA website. Of the aluminum, 34% is assumed to be recycled while 25% of the glass is recycled, and the remaining materials are landfilled and incinerated per the PCR.

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The functional unit represented here refers to 1 square meter of floorspace the product occupies for a period of 10 years, and two units of product are needed to satisty the requirements.

2.2. System Boundary

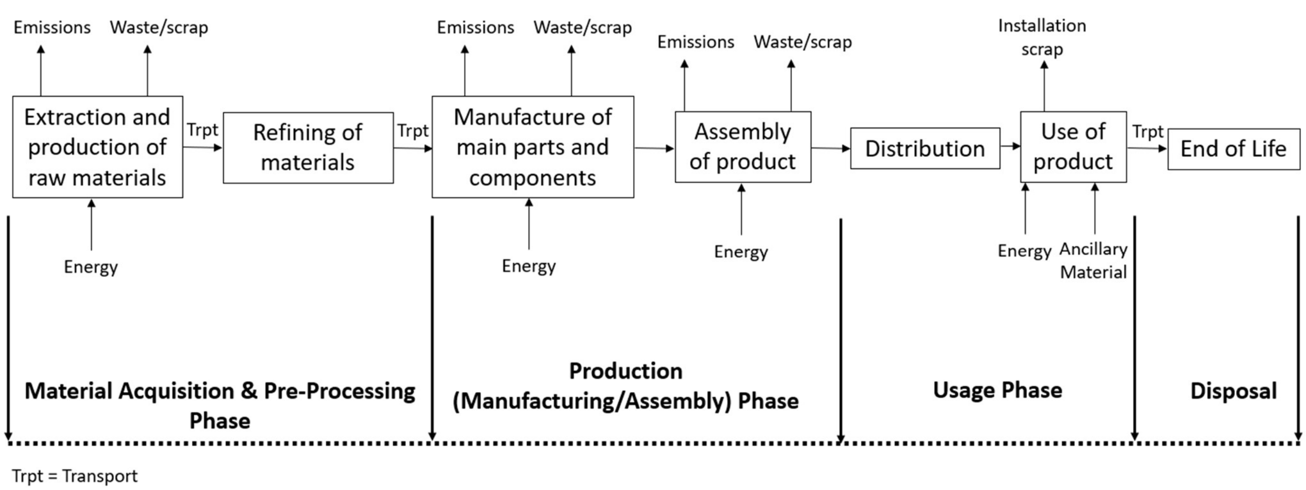

Figure 3 System boundary

The four life cycle stages of the product represents a cradle to grave analysis of the dHive product.

2.3. Estimates and Assumptions

The LCI/LCA assumptions are mentioned below:

- The same resuable packaging was used for all of the projects in 2020 and then sent to disposal
- Transport distance to disposal site is 32 km per the PCR
- Recycling rates for materials at end of life are consitent with those listed on USEPA website

2.4. Cut-off Criteria

According to the PCR, if a mass flow or energy flow is less than 1% of the cumulative mass or energy flow of the system, it may be excluded from the system boundaries. However, the cumulative omitted mass or energy flow shall not exceed 5%. In this study, the cutting fluid used in manufacturing was considerably less than 1% of the cumulative mass flow and was omitted. All of the other raw data obtained from Dynamic Hive concerning raw materials, energy and water use, air emissions, packaging, transportation, and waste generated at the manufacturing plant were included in the study.

2.5. Data Sources

Manufacturing data was collected directly from the plant and utility bills, and materail amounts were obtained from the Bill of Ladings (BOL) for each project in 2020. Seconday data references the DATASMART and ecoinvent 3.8 LCI databases that are widely distributed and referenced within the LCA community.

2.6. Data Quality

Wherever secondary data is used, the studay adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty. The data sources used are complete and representative of North America, and any deviations from these intial data quality requirements for secondary data are documented in the critically reviewed LCA report.

2.7. Period under Review

This study is based on the review of over 20 dHive projects installed in 2020.

2.8. Allocation

Within manufacturing operations, the energy use, water use, and waste generated were allocated based on the mass of aluminum throughput in 2020 for the referenced projects, and they were allocated to the baseline product through the mass of aluminum utilized. For recycling at end of life, the cut-off method was used since the glass and metal being recycled is used within other product systems.

3. Life Cycle Assessment Scenarios

Table 2. Material Acquisition & Pre-Processing

Name	Value	Unit
Vehicle type	Lorry 16-32 ton	
Transport distance	302	km
Weight of products transported (if gross density not reported)	1.83	kg
Percentage of recycled content	0	%

Table 3. Manufacturing & Assembly

Name	Value	Unit
Ancillary materials	-	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0.012	kg
Electricity consumption	0.032	kWh
Other energy carriers	0.003	BTU
Waste materials	0.029	kg

Table 4. Usage

Name	Value	Unit
Vehicle type	Lorry 16-32 ton	
Transport distance	32	km
Weight of products transported (if gross density not reported)	1.83	kg

Table 5. Disposal

Name	Value	Unit
Recycling	0.49	kg
Landfill	1.07	kg
Incineration	0.27	kg

4. Life Cycle Assessment Results

4.1. Life Cycle Impact Assessment Results

Table 6. Net fresh Water (kg)

ReCiPe Midpoint H	Total	Material Acquisition	Manufacturing	Usage	Disposal
Water consumption	3.19E+02	3.17E+02	5.51E-01	2.87E-01	6.39E-01

Table 7. Primary energy demand (MJ)

Cumulative Energy Demand (LHV)	Total	Material Acquisition	Manufacturing	Usage	Disposal
Renewable energy	5.43E+01	5.43E+01	3.46E-02	2.61E-03	6.58E-04
Non-renewable energy	1.90E+02	1.87E+02	7.85E-01	1.68E+00	3.22E-01

Table 8. Traci Impact Assessment Results

TRACI v2.1 (with one exception)	Total	Material Acquisition	Manufacturing	Usage	Disposal
Ozone depletion [kg CFC-11 eq]	1.22E-06	1.19E-06	2.21E-09	2.49E-08	4.13E-09
Smog [kg O_3 eq]	1.15E+00	1.11E+00	9.59E-04	2.88E-02	9.11E-03
GWP 100 – fossil (kg CO2 eq) from IPCC 2021 GWP100	1.68E+01	1.66E+01	3.06E-02	1.25E-01	2.36E-02
Acidification [kg SO2 eq]	1.14E-01	1.13E-01	9.68E-05	9.13E-04	2.88E-04
Eutrophication [kg N eq]	8.33E-03	8.21E-03	8.23E-06	8.57E-05	2.37E-05

Table 9. Toxicity and ecotoxicity (kg 1,4-DB eq)

CML v3.07	Total	Material Acquisition	Manufacturing	Usage	Disposal
Human toxicity	8.17E+00	8.15E+00	8.93E-03	6.06E-03	1.12E-02
Fresh water aquatic ecotoxicity	1.77E-01	1.76E-01	8.55E-05	5.73E-04	1.49E-04
Marine aquatic ecotoxicity	2.91E+04	2.91E+04	2.18E+01	3.80E+00	1.75E+00
Terrestrial ecotoxicity	2.01E-02	2.01E-02	9.60E-06	3.90E-05	6.13E-06

Table 10. Land use (m2a crop eq)

ReCiPe Midpoint H	Total	Material Acquisition	Manufacturing	Usage	Disposal
Land use	5.25E-01	5.28E-01	8.70E-05	-1.29E-05	-2.59E-03

5. LCA Interpretation

Due to the high degree of value add within the glass and aluminum materials that represent a large portion of the product, the material acquisition life cycle stage drive most of the environmental impact categories for dHive, specifically the aluminum.

Where applicable, reduction in amount of aluminum used in the dHive product would have the greatest return on investment.

6. References

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