



UCW8000 Unitized Curtain Wall System



Environmental Product Declaration

Conducted in accordance with ISO 14025 and ISO 21930

EPDs are not intended to make comparisons with other products due to varying background data in LCA softwares and/or varying Program Operator rules or Product Category Rules. An EPD is informational and does not warrant performance.

EPD SUMMARY

Product Name	Harmon UCW8000 Unitized Curtain Wall System
EPD Scope	Cradle-to-Gate
Declaration Holder	Harmon, Inc. www.HarmonInc.com info@harmoninc.com , +1 952.944.5700
Declaration Number	205
Date of Issuance	April 14, 2021
Valid through	April 13, 2026
Program Operator	ASTM International
Reference PCR	Earthsure Cradle to Gate Window Product Category Rule 30171600-2015
PCR Reviewed by	Tom Gloria, LCACP, Industrial Ecology Consultants, Chair; Adolf Merl, ThinkStep GmbH; Philip Moser, Simpson Gumpertz & Heger Inc.
LCA conducted by	Four Elements Consulting, LLC
Third Party Review	Independent verification of the declaration and LCA data, according to ISO 14044:2006, ISO 14025:2006 and ISO 21930:2007 internal <input checked="" type="checkbox"/> external
Review Conducted by:	
Name	Jamie Meil, Research Principal
Organization	Athena Sustainable Materials Institute
Signature	
For more information	Contact Anne Landfield Greig, anne@fourelementslc.com

HARMON, INC.

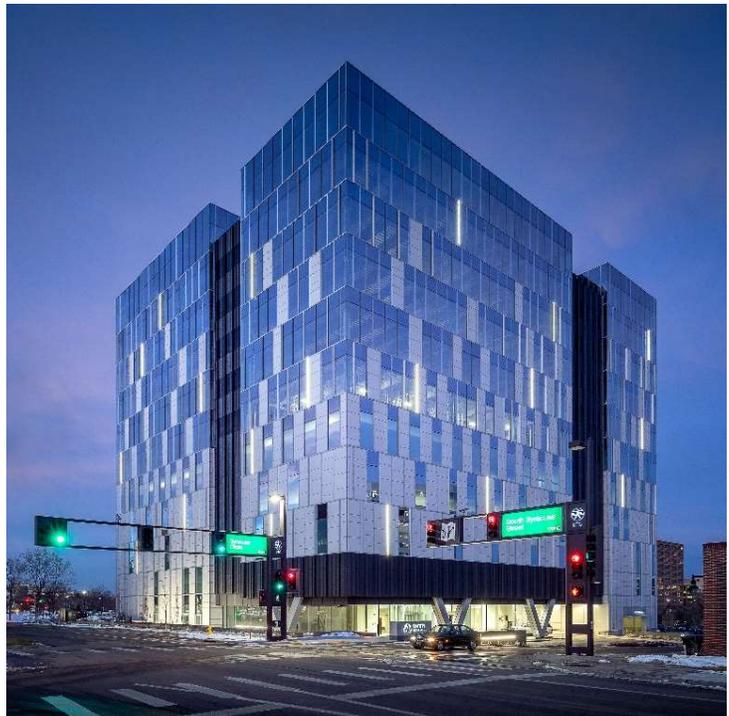
Harmon is one of the most trusted curtain wall contractors in the country to manage building façade projects. We’ve earned this reputation by infusing national capabilities into talent-packed, local offices across the U.S. We form partnerships with our clients and subcontractors – with over 90% becoming repeat customers – that other firms can’t match.

From preconstruction and engineering/design to manufacturing and project management, we build trust in everything we do.

PRODUCT DESCRIPTION & DECLARATION SUMMARY

Harmon UCW8000 is a unitized curtain wall system that is fabricated, assembled and glazed in a controlled shop environment which allows for excellent quality control and results in superior performance for air and water infiltration, building movement, loading and thermal requirements. Unitized curtain wall requires minimal field sealing and reduces the amount of labor required for installation at the job site. UCW8000 is customizable to accommodate variable glass thickness, horizontal and vertical trim, sunshades, module sizes and a variety of infills. For completeness, additional features specified for some UCW8000 projects were evaluated, including insulated back pans and shadowboxes.

Cradle-to-Gate Results Summary		
Declared unit: 1 m ²		
Mass per m ² : 49 kg		
Impact Results		
Global Warming Potential	kg CO2-eq	204
Acidification Potential	kg SO2-eq	1.3
Eutrophication Potential	kg N-eq	0.18
Smog Formation Potential	kg O3-eq	16
Ozone Depletion Potential	kg CFC11-eq	1.22 E-5
Primary Energy		
Non-renewable Energy	MJ	2,760
Renewable Energy	MJ	629
Resources Consumed		
Non-renewable Materials	kg	258
Renewable Materials	kg	22
Net Fresh Water	L	2,160
Non-hazardous Waste	kg	0.25
Hazardous Waste	kg	0.01
Other Declarations		
Recyclable content: aluminum 22%, glass 66%		
Hazardous materials in >0.1% of window: none		



LIFE CYCLE ASSESSMENT OVERVIEW

A cradle-to-grave Life Cycle Assessment (LCA) was completed on Harmon’s unitized curtain wall system in accordance with ISO 14040 / ISO 14044, and the study was reviewed for conformance with ISO 14044 and the PCR. The product assessed was based on data from Harmon’s largest projects in 2019.

SYSTEM BOUNDARIES

The LCA evaluated the cradle to gate of the curtain wall system. This includes: raw material extraction and processing (A1), transportation of the materials to fabrication plants (A2), and manufacturing or fabrication (A3). This is depicted below in the context of the full life cycle as defined in EN 15804, Section 5.2.

Table 1 EPD System Boundary Modules

Product Stage			Construction Process		Use Stage							End-of-Life Stage				Bens/Loads Beyond SB
Raw Material Supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

MND = “module not declared”

Figure 1 presents A1-A3 as they pertain to Harmon and additionally provides aspects of the life cycle that are excluded from the study.

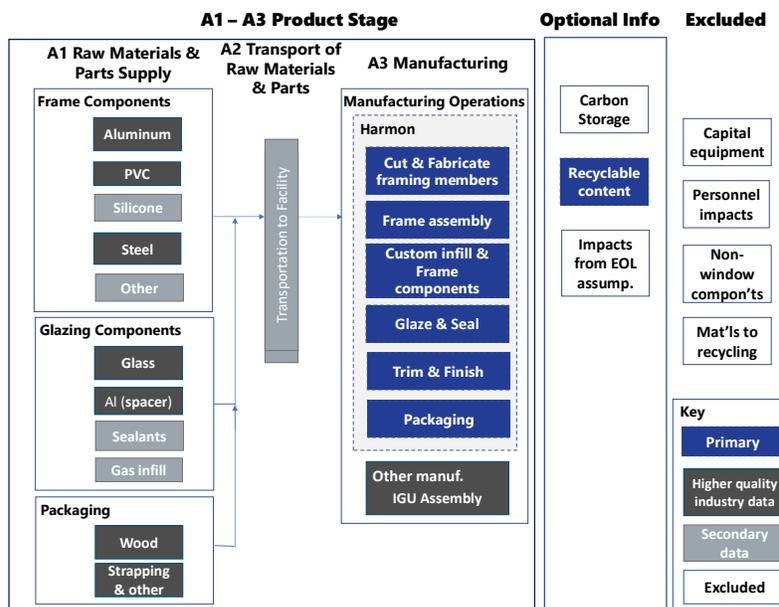


Figure 1 Harmon UCW8000 System Boundary and Data

DECLARED UNIT

The declared unit is one square meter (1 m²) of the UCW8000 system, based on the production weighted average of four Harmon manufacturing facilities. A functional unit is not reported since the product system boundaries are cradle-to-gate, and no use phase over a reference service life has been modeled. As a result, this EPD may not be compared with other EPDs.

A1 RAW MATERIAL EXTRACTION AND PROCESSING

Module A1 accounts for the extraction of materials and production of framing, insulated glass units (IGUs), and packaging parts and components. Additional curtain wall features specified for some projects were evaluated, for the sake of completeness of both the product and the LCA. Insulated back pans are included while shadowboxes were excluded since they were negligible in the overall LCA results.

A2 TRANSPORTATION TO MANUFACTURING

Module A2 models transportation of raw materials to the Harmon manufacturing plants in Baltimore, MD, Dallas, TX, Orlando, FL, and Cincinnati, OH. The distances of each material to the plants by heavy duty diesel truck were based on actual project data provided by Harmon.

A3 MANUFACTURING

Module A3 includes fabrication activities at Harmon's facilities, which include cutting of extruded aluminum lineals, assembly of framing parts, and preparation and assembly of unitized curtain wall sections. 2019 energy use, emissions, and waste management were included in the model. Regional electricity grids were used to account for different geographical locations: Southeast Reliability Corporation (SERC) for Baltimore, Texas Regional Entity (TRE) for Dallas, Florida Reliability Coordinating Council (FRCC) for Orlando, and ReliabilityFirst Corporation (RFC) for Cincinnati.

CUT-OFF CRITERIA

The cut-off goal of at least 95% of all mass and energy used in the system was exceeded since all materials and energy involved in the materials systems were included.

ALLOCATION

Data was provided on a total facility basis. No allocations needed to be made since the vast percentage of product output was the UCW8000 system.

SOFTWARE AND DATA USED

The SimaPro LCA software was used to model the unitized curtain wall system. Data came from sources appropriate for North America and with the highest data quality in mind. Secondary data came from U.S. LCI database, DATASMART, ecoinvent, and pertinent cradle-to-gate production EPDs whose data on anodized, extruded aluminum were deemed appropriate for use in this EPD. The data sets from ecoinvent were customized to North American conditions.

DATA QUALITY

The data applied to this study represent the current Harmon UCW8000 system. Harmon's

manufacturing facilities supplied 2019 process data, which was aggregated on a weighted basis, based on facility production output. Energy and transportation data are based on the late 2010's, and production data for materials are based on mid 2010's through 2020. Data for energy and transportation are North American based. Data for materials and processes are based on a combination of North American and European sources which, where possible, were customized to reflect North American conditions. Technological coverage for the upstream materials and processes are generally industry average, and in some instances, it is typical technology.

RESULTS AND CONTRIBUTION ANALYSIS

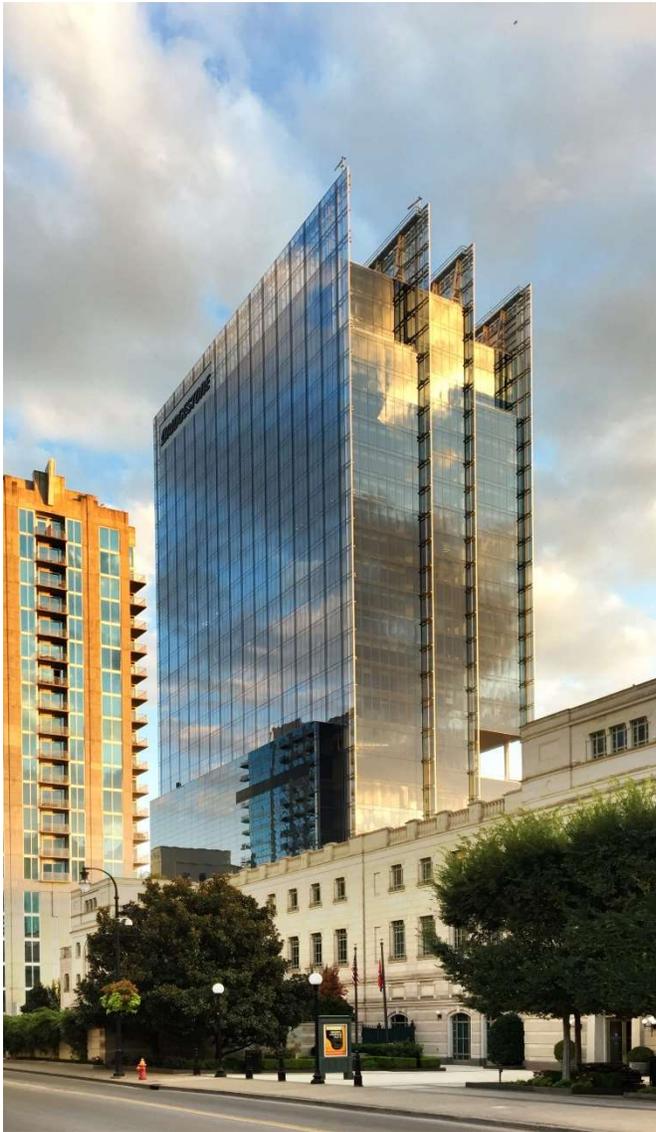
The Life Cycle Impact Assessment (LCIA) results were calculated using the North American impact assessment methodology, Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI) v.2.1. All results are presented for the total of A1 through A3 and the percentage of A1, A2, and A3 to the total.

Table 2 Impact Assessment and Inventory Results – 1 m2 Harmon UCW8000

Impact Category Indicator	Abbrev	Unit	Total	A1 Raw Mat'ls Prod'n	A2 Transp. to Plant	A3 Manuf- acturing
Global warming potential	GWP	kg CO2-eq	203.81	91%	3.8%	5.0%
Acidification potential - soil & water	AP	kg SO2-eq	1.35	90%	7.6%	2.3%
Eutrophication potential	EP	kg N-eq	0.18	64%	3.3%	33%
Smog formation pot'l (tropospheric ozone)	SFP	kg O3-eq	15.69	82%	17%	1.8%
Stratospheric ozone layer depletion pot'l	ODP	kg CFC11-eq	0.00	92%	0%	7.9%
Total primary energy consumption						
Total non-renewable primary energy		MJ (HHV)	2760.26	90%	3.7%	5.9%
Nonrenewable fossil	NRF	MJ (HHV)	2264.06	90%	4.5%	5.0%
Nonrenewable nuclear	NRN	MJ (HHV)	496.21	90%	0%	10%
Total renewable primary energy		MJ (HHV)	628.69	99%	0%	1.1%
Renewable (solar, wind, hydro, geo.)	RSWHG	MJ (HHV)	416.44	99%	0%	1.1%
Renewable (biomass)	RB	MJ (HHV)	212.24	99%	0%	1.0%
Material Resources Consumption						
Nonrenewable material resources	NRMR	kg	258.19	99.8%	0%	0.2%
Renewable material resources	RMR	kg	22.11	99.6%	0%	0.4%
Net fresh water (inputs minus outputs)	NFW	L	2160.50	97.9%	0%	2.1%
Non-hazardous waste generated	NHW	kg	0.25	100.0%	0%	0%
Hazardous waste generated	HW	kg	0.01	100.0%	0%	0%

Notes: Results may not add to 100% due to rounding. 0% implies less than 0.1%.

PERFORMANCE STANDARDS & CERTIFICATIONS



Harmon UCW8000 is tested, certified & labeled for the following performance standards:

- AAMA TIR A-11 Maximum Allowable Deflection of Framing Systems for Building Cladding Components at Design Wind Loads
- AAMA 501.1 Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
- ASTM E283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen
- ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- AAMA 1503, NFRC 100 Thermal Transmittance, U-Factors
- AAMA 1503, NFRC 500 Condensation Rating (CRF,CI)
- NFRC 200 Overall Solar Heat Gain Coefficient and Visible Transmittance (SHGC & VT)

OTHER ENVIRONMENTAL INFORMATION

At end of life, the aluminum and glass, which make up 22% and 66% of the total mass, respectively, are recyclable.

REFERENCES

Aluminum Extruders Council (AEC), Environmental Product Declaration of Aluminum Extrusions: Mill Finished, Painted, and Anodized. Declaration number 11240237.101.1. Dated 4 Oct 2016 and valid 5 years. (AEC, 2016a)

Aluminum Extruders Council (AEC), Environmental Product Declaration of Thermally Improved Aluminum Extrusions: Mill Finished, Painted, and Anodized. Declaration number 11240237.102.1. Dated 4 Oct 2016 and valid 5 years. (AEC, 2016b)

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Four Elements Consulting, LLC, Life Cycle Assessment of Harmon UCW8000 Unitized Curtain Wall System (report in Preparation for an Environmental Product Declaration), dated April 2021.

ISO 14040:2006, The International Standard of the International Standardization Organization, Environmental management. Life cycle assessment. Principles and framework.

ISO 14044:2006/AMD 2:2020, Environmental management – Life cycle assessment – Requirements and guidelines – Amendment 2.

ISO 14025:2006, Environmental Labels and Declarations – Types III Environmental Declarations – Principles and Procedures.

EN 15804:2012+A1:2013 (E), Sustainability of construction works -Environmental product declarations - Core rules for the product category of construction products.

ISO 21930-2007 Sustainability in building construction — Environmental declaration of building products.

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