6450HP Curtain Wall

Northern Facades Limited

ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025:2006 and ISO 21930:2017

ASTM INTERNATIONAL

Northern Facades Limited is pleased to present this Environmental Product Declaration (EPD) for their 6450HP Curtain Wall. This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified by Lindita Bushi, Ph.D., Athena Sustainable Materials Institute.

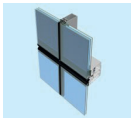
The LCA and the EPD were prepared by Vertima Inc. The EPD includes cradle-to-gate life cycle assessment (LCA) results.

For more information about Northern Facades Limited, visit www.northernfacades.com.

For any explanatory material regarding this EPD, please contact the program operator.

1. GENERAL INFORMATION

PCR GENERAL INFORMATION			
Reference PCR	NSF 1102-23 PCR for Fenestration Assemblies, v.2.0 NSF International, December 2023 to Decembr 2028		
The PCR review was conducted by:	*Dr. Thomas P. Gloria, Ph.D.* *Industrial Ecology Consultants* *t.gloria@industrial-ecology.com*	*Jack Geibig* *EcoForm* *jgeibig@ecoform.com*	*Bill Stough* *Bill Stough, LLC* *bill@billstough.net*

EPD GENERAL INFORMATION		
Program Operator	ASTM 100 Barr Harbor Drive, West Conshohocken, PA 19428, USA www.astm.org	
General Program Instructions	ASTM International, ASTM Program Operator Rules, Version 8.0, 2020.	
Declared Product 	**6450HP Curtain Wall:** unitized curtain wall ready for installation. Composition: IGU (77% - 83%); Painted aluminum extrusion (13% - 18%); Galvanized steel back panel (0% -5%); Insulation (0% - 4%); Silicone seals (2% - 3%); Gaskets (1% - 2%); Fasteners (0.3% - 0.4%).	
EPD Registration Number EPD1145	**EPD Date of Issue** March 18, 2026	**EPD Period of Validity** March 18, 2026 to March 18, 2031
EPD Recipient Organization	Northern Facades Limited 6435 Northwest Drive Mississauga (Ontario) L4V 1K2 Canada www.northernfacades.com	

EPD Type/Scope and Declared Unit	**Assumptions**
Manufacturer-average, product-specific cradle-to-gate EPD with declared unit of one 2,000 mm x 2,000 mm (79 in x 79 in) curtain wall normalized to one square meter (1 m²).	IGU (ecoinvent and EPD data); Aluminum extrusion, galvanized steel and fasteners (Ind. average LCA/EPD data); Insulation (product-specific EPD data); Silicone seals and gaskets (ecoinvent).

Geographical Scope	**LCA Software**	**LCI Databases**	**LCIA Methodology**
North America	OpenLCA v.2.03, 2023	Ecoinvent 3.9.1 (Alloc. cut-off)	TRACI 2.1 and CED, LHV, v1.0
Allocation	**Cut-off criteria**	**Data Quality Assessment**	**Year of Reported Manufacturer Primary Data**
Mass	No flows cut-off	Good	2022

This LCA and EPD were prepared by:	Vertima Inc. www.vertima.ca
This EPD and LCA were independently verified in accordance with ISO14025:2006, ISO14040:2006 and ISO14044:2006, as well as the NSF 1102-23 PCR for Fenestration Assemblies, which is based on ISO 21930:2017. ☐ Internal ☒ External	Lindita Bushi Lindita Bushi, Ph.D. Athena Sustainable Materials Institute

The owner of the declaration shall be liable for the underlying information and evidence; ASTM, or its affiliates, shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence.

LIMITATIONS

Environmental declarations within the same product category but from different programs may not be comparable. [1] This EPD meets all comparability requirements stated in ISO 14025:2006.[1] However, differences in certain assumptions, data quality, and variability between LCA datasets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers or programs, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the construction works level per ISO 21930:2017 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.[2]

[Photo courtesy of Northern Facades]

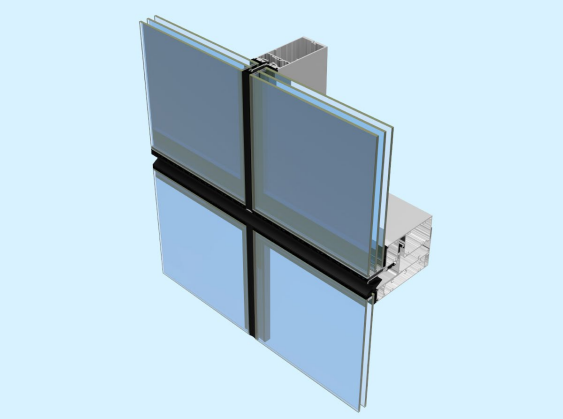
2. PRODUCT SYSTEM DESCRIPTION

Northern Facades Limited, a division of the Flynn Group of Companies, is a North American leading building envelope manufacturer and supplier. For over 40 years, Northern Facades has been providing quality manufactured products in the institutional, commercial, and industrial construction marketplace. Northern Facades focuses on safety culture, sustainability, operational excellence, and innovative practices.

2.1. PRODUCT DESCRIPTION

6450HP is a versatile unitized curtain wall system[1] designed to be assembled and glazed in a controlled environment for increased quality assurance of critical seals and components. Fully engineered and completed unitized frames are shipped directly to the job site permitting rapid installation. 6450HP's adaptability to fulfill most architectural needs lends itself to being one of the most versatile curtain wall systems on the market. A detailed description can be found on Northern Facades Limited's website (Systems – www.northernfacades.com).

The system, which does not include screens, accepts insulating glass units (double or triple-glazed) and offers flexible module sizing for large-format façade design. 6450HP meets stringent North American standards for air infiltration (ASTM E283), water penetration resistance (ASTM E331 & AAMA 501.1), and structural performance (ASTM E330). On site, the product frame is attached to the building structure and does not carry the floor or roof loads of the building.



6450HP Curtain Wall
[Photo courtesy of Northern Facades]

2.2. PERFORMANCE STANDARDS

Northern Facades Limited's 6450HP respects the following standards per product type:

- ASTM E283 - Air Infiltration / Exfiltration by Static Pressure
- ASTM E331 - Water Infiltration by Static Pressure
- AAMA 501.1 - Water Infiltration by Dynamic Pressure
- ASTM E330 - Structural Service Loads
- AAMA 501.4 - Vertical Inter Story Movement / Service Horizontal Inter Story Drift / Ultimate Horizontal Inter Story Drift

[1] CSI MasterFormat code 08 44 13 - Glazed Aluminum Curtain Walls

- NFRC 202, AAMA 1503, CSA A440.2 - Thermal Performance

2.3. MATERIAL COMPOSITION

Materials	6450 HP Curtain Wall Percentage in final product (%)			
	Double-Glazed - 100% Viewable	Triple-Glazed - 100% Viewable	Double-Glazed - 70% Viewable	Triple-Glazed - 70% Viewable
Insulated Glass Unit	77.0%	82.8%	70.2%	77.1%
Painted Aluminum Extrusion	18.0%	13.5%	16.4%	12.6%
Galvanized Steel Back Panels	0.0%	0.0%	5.0%	3.8%
Insulation	0.0%	0.0%	3.9%	3.0%
Silicone Seals	2.8%	2.1%	2.6%	2.0%
Gaskets - Silicone	0.5%	0.4%	0.5%	0.4%
Gaskets - PVC	1.2%	0.9%	1.1%	0.9%
Fasteners	0.4%	0.3%	0.4%	0.3%
TOTAL	**100%**	**100%**	**100%**	**100%**

2.4. MANUFACTURING

The 6450HP Fully Unitized Curtain Wall is manufactured in a controlled factory environment to ensure dimensional precision, quality, and performance. Aluminum extrusions (mullions and transoms) are pre-finished, cut, machined, and fitted with thermal barriers before being assembled with pressure plates, cover caps, gaskets, and structural silicones to form the unitized frames. Insulated glazing units (double- or triple-glazed) are installed into the frames, and for the 70% vision glazing variants, galvanized steel back panels and insulation are integrated into the spandrel zones. The completed modules undergo quality control inspections to ensure watertightness, structural integrity, and proper sealing.

2.5. PACKAGING

The 6450HP Curtain Wall modules are carefully packaged to protect them during transportation and on-site handling. Packaging consists of wooden crates and steel reusable crates, designed to secure the fully unitized, pre-glazed panels and prevent damage. All packaging materials are selected to balance protection with environmental considerations, and efforts are made to maximize recyclability and reuse.

3. LCA CALCULATION RULES

3.1. DECLARED UNIT AND REFERENCE FLOWS

The selected declared unit (DU) for this study is one **2,000 mm x 2,000 mm (79 in x 79 in) curtain wall normalized to one square metre (1 m^2) of fenestration assemblies (including frame and glass)**. Aluminum extrusion, sealants, gaskets, and other parts that retain or support the glazing are considered as part of the framing assembly and not the glazing assembly. Table 2 presents all products targeted by this report and their respective DU.

Item	Unit	6450HP Curtain Wall			
		Double-Glazed - 100% Viewable	Triple-Glazed - 100% Viewable	Double-Glazed - 70% Viewable	Triple-Glazed - 70% Viewable
Declared unit	m^2	1	1	1	1
Mass - whole unit	kg	43.0	57.3	47.1	61.5
Mass – glazing*	kg	33.1	47.4	37.2	51.6
Mass - frame	kg	9.9	9.9	9.9	9.9
Total glass thickness	mm	12	18	12	18

*: Includes IGU, steel back panels and insulation for 70% viewable glazing options.

3.2. PRODUCTION AVERAGE

A mass weighted average is used as the product is fabricated in two facilities, one in Ontario and one in British Columbia. Potential environmental impacts of facility-specific product-specific results do not differ by more than ±10% from the manufacturer-average product-specific EPD results.

3.3. SYSTEM BOUNDARIES

According to the NSF PCR,[2] the system boundaries are **cradle-to-gate**, i.e., only cover the production life cycle module as illustrated in the table below. Within this life cycle stage, three (3) modules are considered, namely A1) Extraction and Upstream Production, A2) Transport to Factory and A-3) Manufacturing. Construction (A4; A5), Use (B1 to B7) and End-of-life (C1 to C4) stages are not included in this study. Figure 2 presents the process flow diagram. Neither green power nor CO_2 credits are used within the framework of this project.

Table 1: Description of the system boundary life cycle stages and related information modules

PRODUCTION STAGE			CONSTRUC-TION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Extraction and Upstream Production	Transport to Factory	Manufacturing	Transport to Site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport to Waste Processing or Disposal	Waste Processing	Disposal of Waste
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Key: X = included; MND = module not declared (excluded)

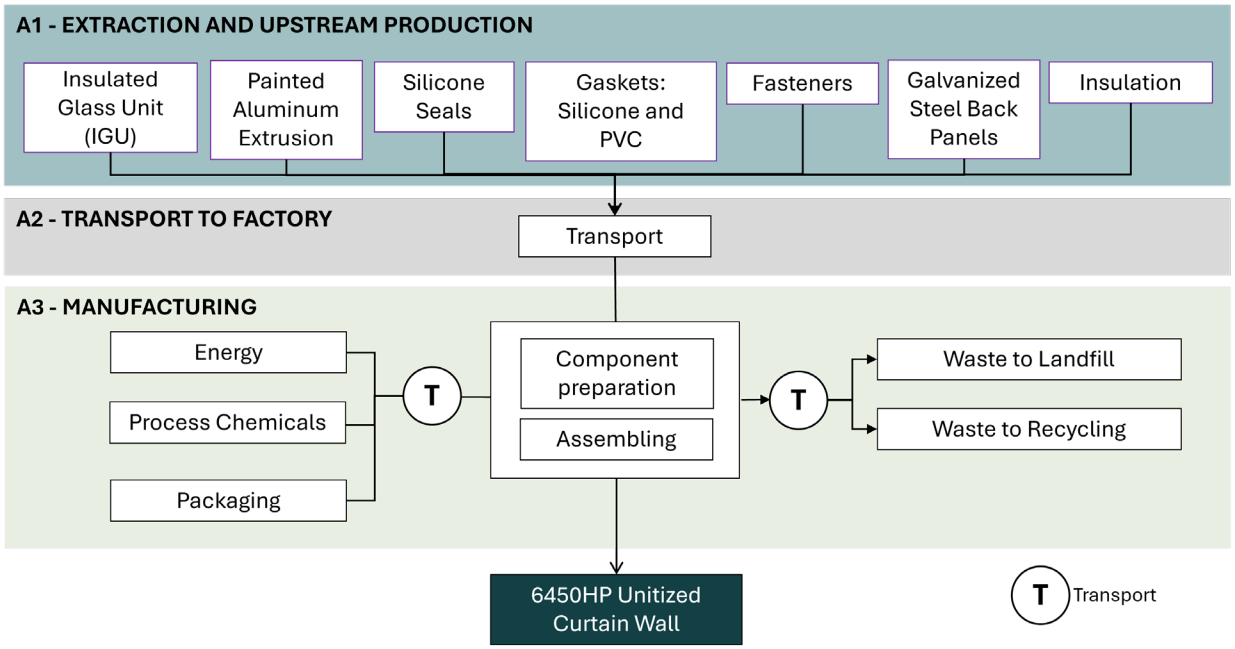


Figure 1: System boundaries of Cradle-to-Gate LCA of the 6450HP Unitized Curtain Wall. "T" refers to transport.

Extraction and upstream production (A1): This module includes the extraction and processing of raw materials needed to produce the 6450HP Fully Unitized Curtain Wall.

Transport to factory (A2): This module includes the transportation of raw materials from suppliers to Northern Facades' manufacturing facilities.

Manufacturing (A3): This module includes energy consumption as well as production waste, which is either recycled or sent to the local landfill. The manufacturing process does not require water, nor does it emit emissions directly to air, water or soil.

Packaging materials to make products ready for shipment, as well as their transport to the manufacturing facility, is also covered by this module.

3.4. CUT-OFF CRITERIA

According to the PCR,[2] cut-off rules shall not be applied in order to hide data. In cases of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1% of renewable primary resource (energy), 1% non-renewable primary resource (energy) usage, 1% of the total mass input of that unit process and 1% of environmental impacts. The total of neglected input flows per module shall be a maximum of 5% of energy usage, mass and environmental impacts.

No known flows are deliberately excluded from this EPD.

For this study, no data on the construction, maintenance or dismantling of the capital assets, daily transport of the employees, office work, business trips and other activities from Northern Facades' employees was included in the model. The model only takes into account the processes associated with infrastructure that are already included in the *ecoinvent* unit processes.

3.5. ALLOCATION

As stated by the PCR, in cases where allocation cannot be avoided, the following hierarchy of allocation methods is preferred:

- mass, or other biophysical relationship; and
- economic value.

Energy data were provided for the entire manufacturing plants; therefore, **mass allocation** was applied to assign the corresponding share of factory energy consumption to the product under study.

Waste processing of material flows undergoing recycling is included up to the system boundary defined by the end-of-waste state. In other words, a cut-off approach was applied, since further processing of the recycled material is considered part of the raw material preparation of another product system (open-loop recycling).

[Photo courtesy of Northern Facades]

3.6. DATA SOURCES AND QUALITY REQUIREMENTS

Data Quality Parameter	Data Quality Discussion
Source of manufacturing data:	Manufacturing data was collected from Northern Facades' manufacturing plants located in Surrey (British Columbia) and Mississauga (Ontario) for the 2022 production year. This data included: total annual mass of products produced at the manufacturing plant; specific product composition; raw materials and fuels entering the product production process; transport distance of materials and fuels; electricity consumption; water consumption; waste treatment; and packaging for each manufacturing facility.
Source of secondary data:	Background data was taken from published LCAs/EPDs, ecoinvent 3.9.1 "cut-off" datasets representative of British Columbia and/or Ontario, Canada, the United States or North America. When appropriate, the grid mix was changed for the grid mix of the province or country where production takes place. Otherwise, ecoinvent data representative of the global market or the "rest-of-the-world" was selected as proxies. The wood dataset was taken from the US LCI Database, which is specific to a North American context.
Geographical representativeness	Northern Facades' manufacturing facilities are based in the province of British Columbia and Ontario (Canada); hence electricity consumption is based on the of British Columbia and Ontario grid mix, while natural gas consumption reflects the Canadian supply mix. Geographical correlation of the material supply and the selected datasets are largely representative of the same area. When this was not possible, datasets representing a larger geographical area were used.
Temporal representativeness	Primary data was collected to be representative of the 2022 full production year. Datasets selected from ecoinvent and US LCI were not always published within the last ten years. Nevertheless, ecoinvent and US LCI remain the primary reference LCI databases.
Technological representativeness	Primary data, obtained from the manufacturer, is representative of the current technologies and materials used by this company.
Completeness	All relevant process steps were considered and modelled to satisfy the goal and scope. No known flows were cut-off.

4. LIFE CYCLE ASSESSMENT RESULTS

4.1. RESULTS TABLES

It should be noted that Life Cycle Impact Assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Results are first presented for the total of the system (the product), then for glazing and finally for the frame.

LCI and LCIA Indicator acronyms

TRACI 2.1 potential impact indicators
GWP: Global Warming Potential; **ADP-ff**: Abiotic Resource Depletion Potential of Non-Renewable (Fossil) Energy Resources; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **SFP**: Smog Formation Potential; **ODP**: Ozone Layer Depletion Potential; **ADP_{fossil}**: Abiotic Depletion Potential for Fossil Resources.
Resource use
RPR_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **RPR_M**: Renewable Primary Resources with Energy Content Used as Material; **RPR_T**: Renewable Primary Resources Total; **$NRPR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$NRPR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$NRPR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **RE**: Recovered Energy; **FW**: Use of Net Fresh Water Resources.
Output flows and waste categories
HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **EE**: Exported Energy.

Table Notes

(1) GWP 100, excludes biogenic CO_2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

(2): GWP 100, excludes biogenic CO_2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

(3): Calculated using CML 4.8.

(4): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED LHV methodology.

(5): Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.

(6): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED LHV methodology.

(7): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.

(8): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption using ReCiPe Midpoint (E) 2016.

(9): Calculated from life cycle inventory results, based on datasets classified under "treatment and disposal of hazardous waste." The manufacturer does not generate hazardous waste during the manufacturing process. The manufacturer does not generate hazardous waste.

(10): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive."

(11): Calculated from life cycle inventory results, based on ecoinvent waste flow "high-level radioactive waste for final repository." The manufacturer does not generate HLRW.

(12): Calculated from life cycle inventory results, based on ecoinvent waste flow "low-level radioactive waste for final repository." The manufacturer does not generate ILLRW.

(13): Significant data limitations currently exist within the LCI data used to generate waste metrics for Life Cycle Assessments and Environmental Product Declarations. The waste metrics were calculated in a way conformant with the requirements of ISO 21930:2017, but these values represent rough estimates and are for informational purposes only. As such, no decisions regarding actual cradle-gate waste performance between products should be derived from these reported values.

Results for 6450HP Unitized Curtain Wall

Environmental Indicator		Unit	6450HP UCW – Double Glazing, 100% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	1.29E+02	6.79E+00	1.38E+01	1.50E+02
	GWP_{100}-AR5[2]	kg CO_2 eq.	1.30E+02	6.88E+00	1.40E+01	1.51E+02
	AP	kg SO2 eq.	5.93E-01	7.04E-02	3.38E-02	6.97E-01
	EP	kg N eq.	9.60E-02	6.74E-03	1.91E-02	1.22E-01
	SFP	kg O_3 eq.	8.35E+00	1.30E+00	8.46E-01	1.05E+01
	ODP	kg CFC-11 eq	1.21E-04	1.23E-07	1.32E-07	1.21E-04
	ADP_{fossil}[3]	MJ, LHV	7.89E+02	8.90E+01	3.93E+01	9.17E+02
Resource Use	RPR_E[4]	MJ, LHV	3.70E+02	1.07E+00	4.61E+01	4.17E+02
	RPR_M[5]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RPR_T	MJ, LHV	3.70E+02	1.07E+00	4.61E+01	4.17E+02
	$NRPR_E$[6]	MJ, LHV	1.45E+03	8.96E+01	1.44E+02	1.68E+03
	$NRPR_M$[7]	MJ, LHV	2.80E+01	0.00E+00	0.00E+00	2.80E+01
	$NRPR_T$	MJ, LHV	1.48E+03	8.96E+01	1.44E+02	1.71E+03
	SM	MJ, LHV	9.70E+00	0.00E+00	0.00E+00	9.70E+00
	RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	1.60E+01	1.80E+01	2.00E+01	2.20E+01
	FW[8]	m^3	1.32E+02	4.49E-03	1.32E-01	1.33E+02
Output flows and waste[13]	HWD[9]	kg	2.37E+01	2.34E+00	5.10E+00	3.12E+01
	NHWD[10]	kg	1.67E+01	5.94E+00	1.13E+01	3.40E+01
	HLRW[11]	m^3	1.80E-07	9.74E-10	4.06E-07	5.87E-07
	ILLRW[12]	m^3	2.26E-06	5.11E-09	2.94E-07	2.56E-06
	CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	MFR	kg	1.00E+00	0.00E+00	2.45E+00	3.45E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Indicator		Unit	6450HP UCW – Double Glazing, 70% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	1.39E+02	6.80E+00	1.51E+01	1.61E+02
	GWP_{100}-AR5[2]	kg CO_2 eq.	1.39E+02	6.89E+00	1.54E+01	1.62E+02
	AP	kg SO2 eq.	9.67E-01	7.05E-02	3.71E-02	1.07E+00
	EP	kg N eq.	9.78E-02	6.75E-03	2.01E-02	1.25E-01
	SFP	kg O_3 eq.	8.63E+00	1.30E+00	9.27E-01	1.09E+01
	ODP	kg CFC-11 eq	1.21E-04	1.23E-07	1.45E-07	1.21E-04
	ADP_{fossil}[3]	MJ, LHV	8.74E+02	8.92E+01	4.30E+01	1.01E+03
Resource Use	RPR_E[4]	MJ, LHV	3.81E+02	1.07E+00	5.06E+01	4.33E+02
	RPR_M[5]	MJ, LHV	1.89E+00	0.00E+00	0.00E+00	1.89E+00
	RPR_T	MJ, LHV	3.83E+02	1.07E+00	5.06E+01	4.35E+02
	$NRPR_E$[6]	MJ, LHV	1.56E+03	8.98E+01	1.57E+02	1.80E+03
	$NRPR_M$[7]	MJ, LHV	3.32E+01	0.00E+00	0.00E+00	3.32E+01
	$NRPR_T$	MJ, LHV	1.59E+03	8.98E+01	1.57E+02	1.84E+03
	SM	MJ, LHV	1.28E+01	0.00E+00	0.00E+00	1.28E+01
	RSF	MJ, LHV	5.17E-02	0.00E+00	0.00E+00	5.17E-02
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	2.00E+01	2.20E+01	2.40E+01	2.60E+01
	FW[8]	m^3	1.33E+02	4.50E-03	1.44E-01	1.33E+02
Output flows and waste[13]	HWD[9]	kg	2.39E+01	2.35E+00	5.59E+00	3.18E+01
	NHWD[10]	kg	1.67E+01	5.95E+00	1.19E+01	3.46E+01
	HLRW[11]	m^3	6.05E-07	9.76E-10	4.46E-07	1.05E-06
	ILLRW[12]	m^3	2.71E-06	5.12E-09	3.23E-07	3.04E-06
	CRU	kg	4.54E-01	0.00E+00	0.00E+00	4.54E-01
	MFR	kg	1.16E+00	0.00E+00	3.16E+00	4.32E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Indicator		Unit	6450HP UCW –Triple-Glazing, 100% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	1.64E+02	8.64E+00	1.84E+01	1.91E+02
	GWP_{100}-AR5[2]	kg CO_2 eq.	1.64E+02	8.75E+00	1.87E+01	1.92E+02
	AP	kg SO2 eq.	7.72E-01	9.04E-02	4.51E-02	9.07E-01
	EP	kg N eq.	1.45E-01	8.58E-03	2.27E-02	1.76E-01
	SFP	kg O_3 eq.	1.14E+01	1.67E+00	1.13E+00	1.42E+01
	ODP	kg CFC-11 eq	1.91E-04	1.56E-07	1.76E-07	1.91E-04
	ADP_{fossil}[3]	MJ, LHV	1.14E+03	1.13E+02	5.26E+01	1.31E+03
Resource Use	RPR_E[4]	MJ, LHV	4.07E+02	1.35E+00	6.16E+01	4.70E+02
	RPR_M[5]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RPR_T	MJ, LHV	4.07E+02	1.35E+00	6.16E+01	4.70E+02
	$NRPR_E$[6]	MJ, LHV	1.84E+03	1.14E+02	1.92E+02	2.14E+03
	$NRPR_M$[7]	MJ, LHV	2.80E+01	0.00E+00	0.00E+00	2.80E+01
	$NRPR_T$	MJ, LHV	1.86E+03	1.14E+02	1.92E+02	2.17E+03
	SM	MJ, LHV	1.00E+01	0.00E+00	0.00E+00	1.00E+01
	RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	2.40E+01	2.60E+01	2.80E+01	3.00E+01
	FW[8]	m^3	1.64E+02	5.68E-03	1.76E-01	1.64E+02
Output flows and waste[13]	HWD[9]	kg	4.84E+01	2.97E+00	6.80E+00	5.82E+01
	NHWD[10]	kg	1.87E+01	7.50E+00	1.59E+01	4.20E+01
	HLRW[11]	m^3	2.64E-07	1.23E-09	5.42E-07	8.08E-07
	ILLRW[12]	m^3	2.63E-06	6.47E-09	3.93E-07	3.03E-06
	CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	MFR	kg	1.50E+00	0.00E+00	2.49E+00	3.99E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Indicator		Unit	6450HP UCW – Triple-Glazing, 70% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	1.73E+02	8.65E+00	1.98E+01	2.01E+02
	GWP_{100}-AR5[2]	kg CO_2 eq.	1.74E+02	8.76E+00	2.00E+01	2.02E+02
	AP	kg SO2 eq.	1.15E+00	9.04E-02	4.84E-02	1.28E+00
	EP	kg N eq.	1.46E-01	8.59E-03	2.37E-02	1.79E-01
	SFP	kg O_3 eq.	1.17E+01	1.67E+00	1.21E+00	1.46E+01
	ODP	kg CFC-11 eq	1.91E-04	1.56E-07	1.89E-07	1.91E-04
	ADP_{fossil}[3]	MJ, LHV	1.23E+03	1.13E+02	5.63E+01	1.40E+03
Resource Use	RPR_E[4]	MJ, LHV	4.18E+02	1.35E+00	6.61E+01	4.85E+02
	RPR_M[5]	MJ, LHV	1.89E+00	0.00E+00	0.00E+00	1.89E+00
	RPR_T	MJ, LHV	4.20E+02	1.35E+00	6.61E+01	4.87E+02
	$NRPR_E$[6]	MJ, LHV	1.94E+03	1.14E+02	2.06E+02	2.26E+03
	$NRPR_M$[7]	MJ, LHV	3.32E+01	0.00E+00	0.00E+00	3.32E+01
	$NRPR_T$	MJ, LHV	1.98E+03	1.14E+02	2.06E+02	2.30E+03
	SM	MJ, LHV	1.31E+01	0.00E+00	0.00E+00	1.31E+01
	RSF	MJ, LHV	5.17E-02	0.00E+00	0.00E+00	5.17E-02
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	2.80E+01	3.00E+01	3.20E+01	3.40E+01
	FW[8]	m^3	1.64E+02	5.69E-03	1.89E-01	1.64E+02
Output flows and waste[13]	HWD[9]	kg	4.85E+01	2.97E+00	7.30E+00	5.88E+01
	NHWD[10]	kg	1.87E+01	7.52E+00	1.65E+01	4.27E+01
	HLRW[11]	m^3	6.89E-07	1.24E-09	5.82E-07	1.27E-06
	ILLRW[12]	m^3	3.08E-06	6.49E-09	4.21E-07	3.51E-06
	CRU	kg	4.54E-01	0.00E+00	0.00E+00	4.54E-01
	MFR	kg	1.66E+00	0.00E+00	3.21E+00	4.86E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Results for glazing

Environmental Indicator		Unit	GLAZING for 6450HP UCW – Double Glazing, 100% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	6.37E+01	4.27E+00	1.06E+01	7.86E+01
	GWP_{100}-AR5[2]	kg CO_2 eq.	6.41E+01	4.33E+00	1.08E+01	7.92E+01
	AP	kg SO2 eq.	3.43E-01	4.63E-02	2.60E-02	4.15E-01
	EP	kg N eq.	7.96E-02	4.27E-03	8.31E-03	9.22E-02
	SFP	kg O_3 eq.	5.86E+00	8.58E-01	6.54E-01	7.38E+00
	ODP	kg CFC-11 eq	1.20E-04	7.69E-08	1.02E-07	1.20E-04
	ADP_{fossil}[3]	MJ, LHV	6.67E+02	5.58E+01	3.05E+01	7.53E+02
Resource Use	RPR_E[4]	MJ, LHV	5.90E+01	6.62E-01	3.55E+01	9.52E+01
	RPR_M[5]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RPR_T	MJ, LHV	5.90E+01	6.62E-01	3.55E+01	9.52E+01
	$NRPR_E$[6]	MJ, LHV	7.11E+02	5.62E+01	1.11E+02	8.78E+02
	$NRPR_M$[7]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	$NRPR_T$	MJ, LHV	7.11E+02	5.62E+01	1.11E+02	8.78E+02
	SM	MJ, LHV	6.53E-01	0.00E+00	0.00E+00	6.53E-01
	RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	0.00E+00	1.00E+00	2.00E+00	3.00E+00
	FW[8]	m^3	6.25E+01	2.78E-03	1.01E-01	6.26E+01
Output flows and waste[13]	HWD[9]	kg	1.76E+01	1.45E+00	3.93E+00	2.30E+01
	NHWD[10]	kg	2.96E+00	3.62E+00	1.05E+01	1.71E+01
	HLRW[11]	m^3	1.43E-07	6.03E-10	3.13E-07	4.56E-07
	ILLRW[12]	m^3	5.96E-07	3.17E-09	2.27E-07	8.25E-07
	CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	MFR	kg	9.93E-01	0.00E+00	1.03E-01	1.10E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Indicator		Unit	GLAZING for 6450HP UCW – Double Glazing, 70% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	7.31E+01	4.29E+00	1.19E+01	8.94E+01
	GWP_{100}-AR5[2]	kg CO_2 eq.	7.35E+01	4.34E+00	1.21E+01	8.99E+01
	AP	kg SO2 eq.	7.16E-01	4.63E-02	2.93E-02	7.92E-01
	EP	kg N eq.	8.14E-02	4.28E-03	9.35E-03	9.50E-02
	SFP	kg O_3 eq.	6.15E+00	8.58E-01	7.35E-01	7.74E+00
	ODP	kg CFC-11 eq	1.20E-04	7.72E-08	1.15E-07	1.20E-04
	ADP_{fossil}[3]	MJ, LHV	7.52E+02	5.60E+01	3.43E+01	8.42E+02
Resource Use	RPR_E[4]	MJ, LHV	7.00E+01	6.64E-01	4.00E+01	1.11E+02
	RPR_M[5]	MJ, LHV	1.89E+00	0.00E+00	0.00E+00	1.89E+00
	RPR_T	MJ, LHV	7.19E+01	6.64E-01	4.00E+01	1.13E+02
	$NRPR_E$[6]	MJ, LHV	8.19E+02	5.63E+01	1.25E+02	1.00E+03
	$NRPR_M$[7]	MJ, LHV	5.21E+00	0.00E+00	0.00E+00	5.21E+00
	$NRPR_T$	MJ, LHV	8.24E+02	5.63E+01	1.25E+02	1.01E+03
	SM	MJ, LHV	3.73E+00	0.00E+00	0.00E+00	3.73E+00
	RSF	MJ, LHV	5.17E-02	0.00E+00	0.00E+00	5.17E-02
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	4.00E+00	5.00E+00	6.00E+00	7.00E+00
	FW[8]	m^3	6.26E+01	2.79E-03	1.14E-01	6.27E+01
Output flows and waste[13]	HWD[9]	kg	1.77E+01	1.45E+00	4.42E+00	2.36E+01
	NHWD[10]	kg	2.96E+00	3.64E+00	1.11E+01	1.77E+01
	HLRW[11]	m^3	5.68E-07	6.06E-10	3.52E-07	9.21E-07
	ILLRW[12]	m^3	1.05E-06	3.18E-09	2.55E-07	1.31E-06
	CRU	kg	4.54E-01	0.00E+00	0.00E+00	4.54E-01
	MFR	kg	1.15E+00	0.00E+00	8.15E-01	1.96E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Indicator		Unit	GLAZING for 6450HP UCW –Triple-Glazing, 100% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	9.79E+01	6.12E+00	1.52E+01	1.19E+02
	GWP_{100}-AR5[2]	kg CO_2 eq.	9.84E+01	6.20E+00	1.54E+01	1.20E+02
	AP	kg SO2 eq.	5.21E-01	6.63E-02	3.74E-02	6.25E-01
	EP	kg N eq.	1.28E-01	6.11E-03	1.19E-02	1.46E-01
	SFP	kg O_3 eq.	8.91E+00	1.23E+00	9.38E-01	1.11E+01
	ODP	kg CFC-11 eq	1.90E-04	1.10E-07	1.46E-07	1.90E-04
	ADP_{fossil}[3]	MJ, LHV	1.02E+03	7.99E+01	4.38E+01	1.14E+03
Resource Use	RPR_E[4]	MJ, LHV	9.57E+01	9.48E-01	5.10E+01	1.48E+02
	RPR_M[5]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RPR_T	MJ, LHV	9.57E+01	9.48E-01	5.10E+01	1.48E+02
	$NRPR_E$[6]	MJ, LHV	1.10E+03	8.04E+01	1.59E+02	1.34E+03
	$NRPR_M$[7]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	$NRPR_T$	MJ, LHV	1.10E+03	8.04E+01	1.59E+02	1.34E+03
	SM	MJ, LHV	9.80E-01	0.00E+00	0.00E+00	9.80E-01
	RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	8.00E+00	9.00E+00	1.00E+01	1.10E+01
	FW[8]	m^3	9.38E+01	3.97E-03	1.45E-01	9.39E+01
Output flows and waste[13]	HWD[9]	kg	4.23E+01	2.07E+00	5.64E+00	5.00E+01
	NHWD[10]	kg	4.90E+00	5.19E+00	1.51E+01	2.51E+01
	HLRW[11]	m^3	2.27E-07	8.64E-10	4.49E-07	6.77E-07
	ILLRW[12]	m^3	9.65E-07	4.53E-09	3.25E-07	1.29E-06
	CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	MFR	kg	1.49E+00	0.00E+00	1.48E-01	1.64E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental Indicator		Unit	GLAZING for 6450HP UCW – Triple-Glazing, 70% Viewable			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	1.07E+02	6.13E+00	1.66E+01	1.30E+02
	GWP_{100}-AR5[2]	kg CO_2 eq.	1.08E+02	6.21E+00	1.68E+01	1.31E+02
	AP	kg SO2 eq.	8.95E-01	6.63E-02	4.06E-02	1.00E+00
	EP	kg N eq.	1.30E-01	6.12E-03	1.30E-02	1.49E-01
	SFP	kg O_3 eq.	9.20E+00	1.23E+00	1.02E+00	1.14E+01
	ODP	kg CFC-11 eq	1.90E-04	1.10E-07	1.59E-07	1.90E-04
	ADP_{fossil}[3]	MJ, LHV	1.10E+03	8.00E+01	4.75E+01	1.23E+03
Resource Use	RPR_E[4]	MJ, LHV	1.07E+02	9.50E-01	5.55E+01	1.63E+02
	RPR_M[5]	MJ, LHV	1.89E+00	0.00E+00	0.00E+00	1.89E+00
	RPR_T	MJ, LHV	1.09E+02	9.50E-01	5.55E+01	1.65E+02
	$NRPR_E$[6]	MJ, LHV	1.21E+03	8.06E+01	1.73E+02	1.46E+03
	$NRPR_M$[7]	MJ, LHV	5.21E+00	0.00E+00	0.00E+00	5.21E+00
	$NRPR_T$	MJ, LHV	1.21E+03	8.06E+01	1.73E+02	1.46E+03
	SM	MJ, LHV	4.06E+00	0.00E+00	0.00E+00	4.06E+00
	RSF	MJ, LHV	5.17E-02	0.00E+00	0.00E+00	5.17E-02
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	1.20E+01	1.30E+01	1.40E+01	1.50E+01
	FW[8]	m^3	9.38E+01	3.98E-03	1.58E-01	9.40E+01
Output flows and waste[13]	HWD[9]	kg	4.24E+01	2.08E+00	6.13E+00	5.06E+01
	NHWD[10]	kg	4.90E+00	5.20E+00	1.57E+01	2.58E+01
	HLRW[11]	m^3	6.52E-07	8.66E-10	4.88E-07	1.14E-06
	ILLRW[12]	m^3	1.42E-06	4.54E-09	3.54E-07	1.78E-06
	CRU	kg	4.54E-01	0.00E+00	0.00E+00	4.54E-01
	MFR	kg	1.64E+00	0.00E+00	8.59E-01	2.50E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

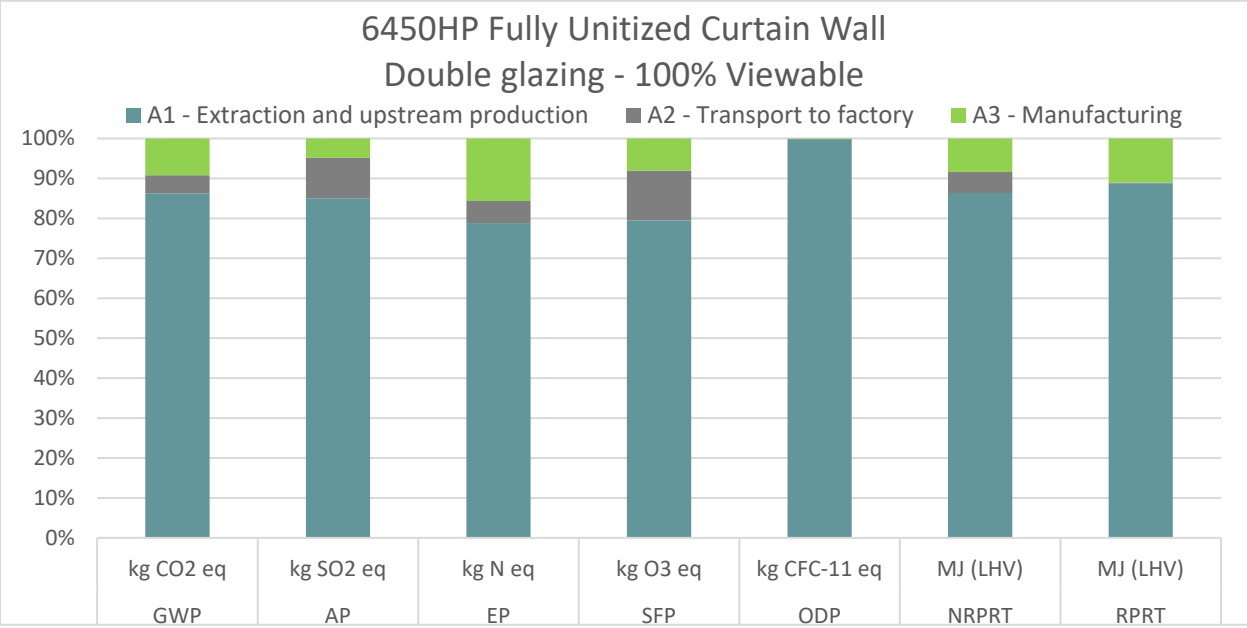
Results for the frame

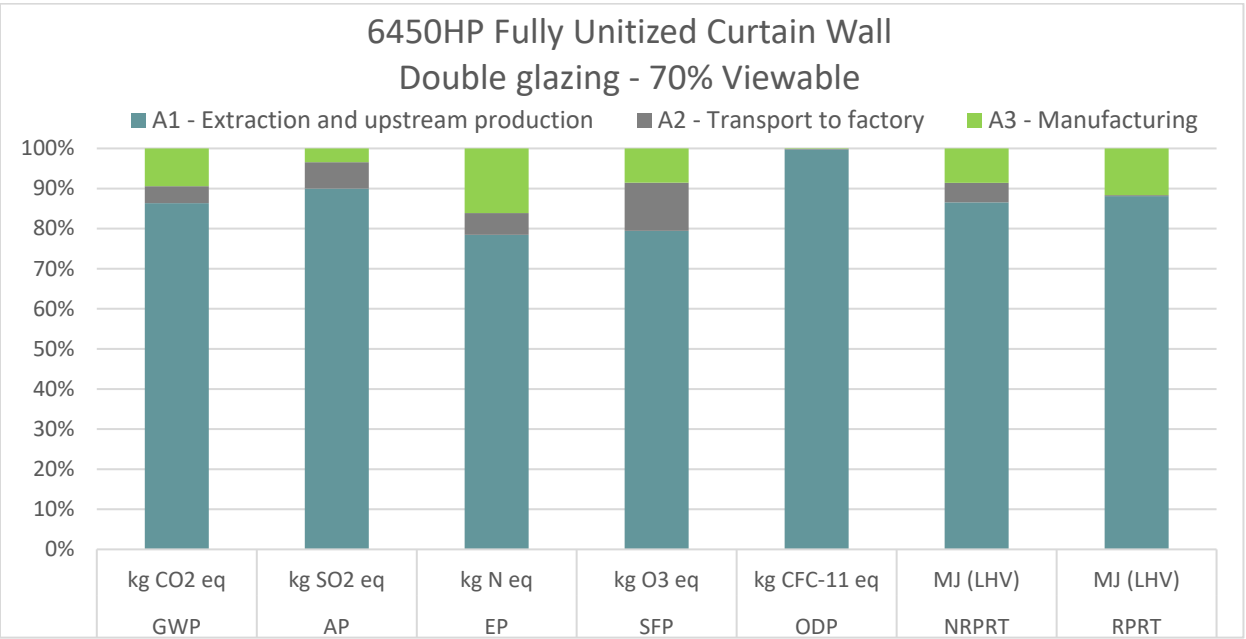
It should be noted that the same frame is used in all products, i.e., with double or triple-glazed, 100% or 70% viewable glazing.

Environmental Indicator		Unit	FRAME for 6450HP UCW – All products			
			A1*	A2	A3	A1 - A3
			(per m^2)	(per m^2)	(per m^2)	(per m^2)
TRACI 2.1	GWP_{100}-AR4[1]	kg CO_2 eq.	6.57E+01	2.52E+00	3.20E+00	7.14E+01
	GWP_{100}-AR5[2]	kg CO_2 eq.	6.58E+01	2.55E+00	3.25E+00	7.16E+01
	AP	kg SO2 eq.	2.50E-01	2.41E-02	7.79E-03	2.82E-01
	EP	kg N eq.	1.64E-02	2.47E-03	1.08E-02	2.96E-02
	SFP	kg O_3 eq.	2.48E+00	4.46E-01	1.92E-01	3.12E+00
	ODP	kg CFC-11 eq	1.36E-06	4.57E-08	3.00E-08	1.44E-06
	ADP_{fossil}[3]	MJ, LHV	1.22E+02	3.32E+01	8.74E+00	1.64E+02
Resource Use	RPR_E[4]	MJ, LHV	3.11E+02	4.05E-01	1.06E+01	3.22E+02
	RPR_M[5]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RPR_T	MJ, LHV	3.11E+02	4.05E-01	1.06E+01	3.22E+02
	$NRPR_E$[6]	MJ, LHV	7.38E+02	3.35E+01	3.28E+01	8.04E+02
	$NRPR_M$[7]	MJ, LHV	2.80E+01	0.00E+00	0.00E+00	2.80E+01
	$NRPR_T$	MJ, LHV	7.66E+02	3.35E+01	3.28E+01	8.32E+02
	SM	MJ, LHV	9.05E+00	0.00E+00	0.00E+00	9.05E+00
	RSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRSF	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	RE	MJ, LHV	1.60E+01	1.70E+01	1.80E+01	1.90E+01
	FW[8]	m^3	7.00E+01	1.71E-03	3.03E-02	7.00E+01
Output flows and waste[13]	HWD[9]	kg	6.13E+00	8.91E-01	1.17E+00	8.19E+00
	NHWD[10]	kg	1.38E+01	2.31E+00	8.15E-01	1.69E+01
	HLRW[11]	m^3	3.71E-08	3.70E-10	9.35E-08	1.31E-07
	ILLRW[12]	m^3	1.66E-06	1.94E-09	6.77E-08	1.73E-06
	CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	MFR	kg	1.20E-02	0.00E+00	2.35E+00	2.36E+00
	MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

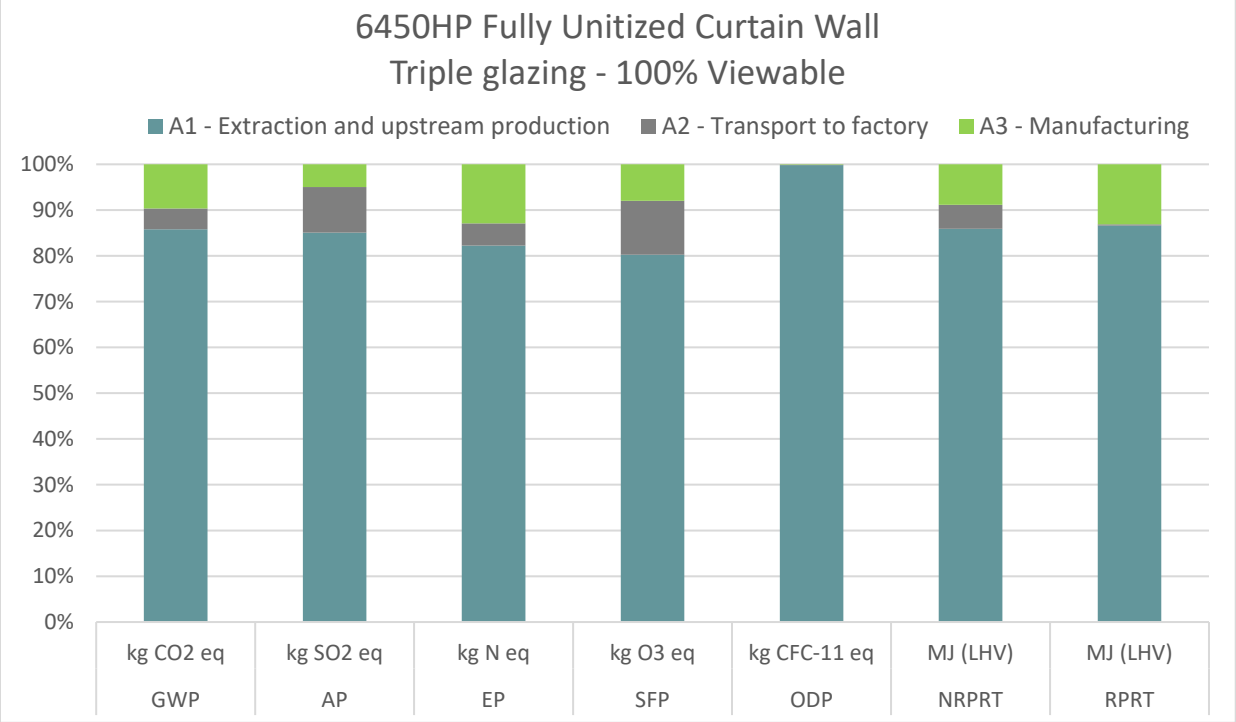
4.2. CONTRIBUTION ANALYSIS

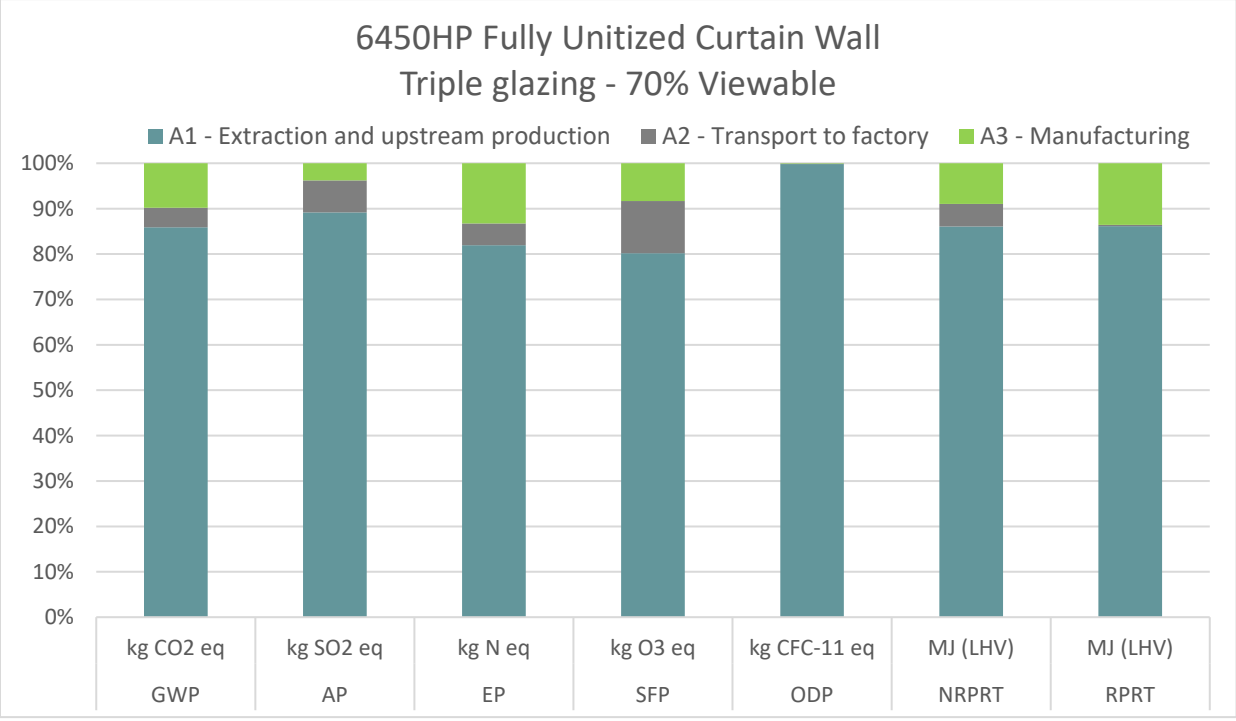
This section details the contribution to the potential environmental impacts and resource use of the different production life cycle modules. As can be seen from the contribution graphs, the extraction and upstream production module (A1) is the main contributor across all assessed environmental impact categories, as well as in the consumption of both renewable and non-renewable primary energy resources.





GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **SFP:** Smog Formation Potential; **ODP**: Ozone Layer Depletion Potential; **NRPRT**: Non-Renewable Primary Resources – Total; **RPRT**: Renewable Primary Resources - Total.





GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **SFP:** Smog Formation Potential; **ODP**: Ozone Layer Depletion Potential; **NRPRT**: Non-Renewable Primary Resources – Total; **RPRT**: Renewable Primary Resources - Total.

5. ADDITIONAL ENVIRONMENTAL INFORMATION

5.1. CONTENT OF REGULATED HAZARDOUS SUBSTANCES

To our knowledge, products are not known to contain hazardous substances.

5.2. RELEASE OF DANGEROUS SUBSTANCES FROM THE CONSTRUCTION PRODUCT

The product is not known to release dangerous substances.

Northern Facades 6450HP curtain wall systems are composed of durable materials such as aluminum framing, insulated glazing units (double or triple-glazed), galvanized steel back panels, and high-performance silicone seals.

5.3. THERMAL EFFICIENCY

The 6450HP Curtain Wall system provides high thermal efficiencies, with tested values in accordance with NFRC 201, AAMA 1503, and CSA A440.2.

5.4. OTHER ADDITIONAL INFORMATION

Northern Facades is fully committed to the diligent protection of both the environment and the health and safety of its workers and its customers' workers. Its manufacturing process includes state-of-the-art environmental control equipment and workers are equipped with the highest quality personal protection gear. Northern Facades research and development process strives to create architectural products that have a sustainable impact on buildings and their occupants.

6. REFERENCES

[1] International Organization for Standardization (ISO), "ISO 14025 Environmental labels and declarations - Type III environmental declarations - Principles and procedures," 2006.

[2] NSF International, "NSF 1102-23 PCR for Fenestration Assemblies," 2023[Online]. Available: https://www.nsf.org/nsf-standards/product-category-rules.

[3] International Organization for Standardization (ISO), "ISO 14040:2006/AMD 1:2020 Environmental management - Life cycle assessment - Principles and framework," 2020.

[4] International Organization for Standardization (ISO), "ISO 14044:2006/AMD1:2017/AMD 2:2020 Environmental management - Life cycle assessment - Requirements and guidelines," 2006.

[5] International Organization for Standardization (ISO), "ISO 21930:2017(E) Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services," 2017.

[6] Vertima, "Life Cycle Assessment of Northern Facades' 6450HP Unitized Curtain Wall," 2026.

[7] ASTM International, "ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20," 2020[Online]. Available: www.astm.org.

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EPD

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