

## ENVIRONMENTAL PRODUCT DECLARATION

# ALUMINUM CURTAIN WALL SYSTEMS

YKK AP AMERICA, ENERGIFACADE® ENERGY EFFICIENT BUILDING SOLUTIONS, PROTEK®  
HURRICANE MITIGATION AND BLAST MITIGATION SYSTEMS



*YKK AP® curtain walls are used in many applications, shown here at One Crescent Drive*

*All YKK AP® products are manufactured, finished and inspected for quality in the YKK AP environmentally certified, state-of-the-art facility in Dublin, GA*



YKK AP America is taking positive steps toward sustainable manufacturing helping to balance ecology and economy—improving the environment and society over the longterm. YKK AP® is the proud manufacturer of architectural products, including aluminum sun control systems, which provide safe and comfortable environments for building occupants and help reduce energy usage.

A dedicated partner in green building design and sustainability, YKK AP helps create innovative, high quality architectural systems that add to the strength, energy efficiency and longevity of the building envelope.

All YKK AP® products are created in a facility that is a model of environmental responsibility. YKK AP's U.S. manufacturing plant in Dublin, GA, is ISO 14001 certified and has been recognized by the U.S. Department of Energy for exceptional leadership in industrial energy efficiency.

For additional information, visit [commercial.ykkap.com](http://commercial.ykkap.com).



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YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL ENVIRONMENT 333 PFINGSTEN RD, NORTHBROOK, IL 60062 Program Operator Rules v 2.7 2022	WWW.UL.COM WWW.SPOT.UL.COM
MANUFACTURER NAME AND ADDRESS	YKK AP Headquarters 101 Marietta Street NW, Suite 2700 Atlanta, GA 30303	
DECLARATION NUMBER	4789555932.101.1	
DECLARED PRODUCT & DECLARED UNIT	Aluminum Curtain Wall System 1 m <sup>2</sup>	
REFERENCE PCR AND VERSION NUMBER	Product Category Rules for Building Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Edition 6 (ULE, 2022) ; and, Part B: PCR for curtain walls (IBU, V1.7, 04.01.2019) (IBU, 2019)	
DESCRIPTION OF PRODUCT APPLICATION/USE	Self-supporting façade element / Used in construction / Curtain wall application	
MARKETS OF APPLICABILITY	North America	
DATE OF ISSUE	December 1, 2022	
PERIOD OF VALIDITY	5 years	
EPD TYPE	Company specific	
EPD SCOPE	Cradle to gate	
YEAR(S) OF REPORTED PRIMARY DATA	2019	
LCA SOFTWARE & VERSION NUMBER	GaBi v10 (Sphera, 2020)	
LCI DATABASE(S) & VERSION NUMBER	GaBi 2021 (CUP 2021.1)	
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5 (GWP), CML-IA v4.8, (GaBi, 2021), TRACI 2.1 (Bare, 2012)	

The sub-category PCR review was conducted by:	Institut Bauen und Umwelt (IBU)
	PCR review panel
	ibu-epd.com
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," in conformance with ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG 

## LIMITATIONS

The environmental impact results of steel products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the steel product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. See the results section for additional EPD comparability guidelines.

Environmental declarations from different programs (ISO 14025) may not be comparable.



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Aluminum Curtain Wall System

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ISO 21930:2017

## General Information

### Description of Organization

Curtain wall systems clad a building envelope with glass and aluminum to protect the interior from the elements and create a safe and comfortable work environment for the building occupants. Curtain walls are designed to only carry their own weight. The wall transfers wind loads to the main building structure, also known as the main wind force resisting system (MWFRS), at connection points in the floors or columns of the building. A curtain wall is designed to resist air and water infiltration as well as sway created by wind and seismic forces and its own weight.

Curtain walls may span from floor to floor, used in punched opening applications, or span multiple floors, and take into consideration design requirements such as: thermal expansion and contraction; building sway and movement; water diversion; and thermal efficiency for cost-effective heating, cooling, and lighting in the building.

YKK AP offers a range of installation and aesthetic options to meet your project needs. Curtain wall systems are available with inside, outside, or structurally glazed options. Stick built, unitized and cassette (carrier frame) system options are available with many sightlines and mullion depths allowing you to control cost by selecting the ideal mullion depth for your opening size and design pressure requirements. Optional face covers expand design flexibility.

All YKK AP® products are manufactured, finished and inspected for quality in YKK AP's environmentally certified, state-of-the-art facility in Dublin, GA. As a result, YKK AP products fit together without a lot of jobsite re-work. YKK AP offers a complete suite of tools and engineering services to assist in proper system selection, specification and installation.

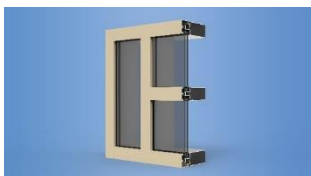
#### Materials &Coatings

Aluminum Alloys: 6063  
T5, 6063 T6, 6061 T6

Available Finishes:  
ANODIZED PLUS®, AAMA  
2604/2605 Painted  
Finishes

### Product Description

The following YKK AP America aluminum curtain wall systems are covered by this EPD (glazing is excluded from this study):



#### YCW 700 2-1/4" x 7" Thermally Improved Outside Glazed Curtain Wall System

YCW 700 combines the strength and flexibility of a curtain wall with the excellent thermal characteristics of a thermal clip system.



#### YCW 750 IG 2-1/2" x 5-1/4", 6", 6-3/4", 7-1/2" Inside Glazed Curtain Wall System

YCW 750 IG (Inside Glazed) is primarily an inside glazed curtain wall system designed for low to mid-rise applications.



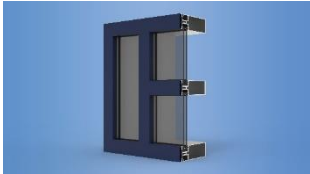
## ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

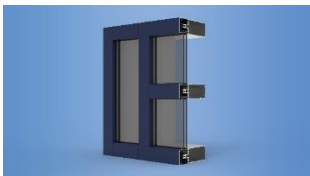
Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017



### **YCW 750 OG 2-1/2" x 5-1/4", 6", 6-3/4", 7-1/2" Outside Glazed Open Back Curtain Wall System**

YCW 750 OG (Outside Glazed) is a pressure wall system that provides the flexibility required for today's projects. With a typical 3/16" wall thickness it provides exceptional durability making it ideal for use in high traffic areas.



### **YCW 750 OGP 2-1/2" x 5-1/4", 6", 6-3/4", 7-1/2" Outside Glazed Open Back Curtain Wall System with Polyamide Pressure Plate**

YCW 750 OGP reduces temperature transfer from the exterior to the interior creating more comfortable interior space. The system utilizes a low conductivity pressure plate made from an industry proven material, Polyamide 6/6.



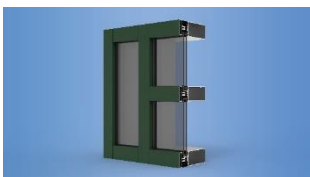
### **YCW 750 SSG 2-1/2" x 5-1/16" to 10-1/2" Two and Four-Side Silicone Glazed Curtain Wall System**

The popular YCW 750 family of products has been expanded to include 4-side structural silicone glazing. This stick-built system is designed for glazing either in the field or in a climate controlled environment for increased quality assurance of critical seals.



### **YCW 750 SplineTech® 2-1/2" x 5-1/4", 6", 6-3/4", 7-1/2" Outside Glazed Screw Spline Curtain Wall System**

YCW 750 SplineTech is the latest addition to YKK AP's very successful line of curtain wall glazing systems. The new system shares many of the same features, options, and accessories with the YCW 750 outside glazed curtain wall system, but it is designed to simplify fabrication and assembly.



### **YCW 750 XT/XTP enerGfacade® 2-1/2" x 6", 6-3/4", 7-1/2", 8", 8-1/4", 8-1/2", 9", 9-3/4", 10" High Performance Curtain Wall System Featuring Dual Thermal Barriers**

YCW 750 XT/XTP yields best-in-class thermal performance and exceeds not only current codes, but also exceeds the most stringent green building codes and standards in the market today.



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017



## **YCW 750 XT IG enerGfacade® 2-1/2" x 6", 7-1/2" Inside Glazed High Performance Curtain Wall System**

YCW 750 XT IG is an inside glazed curtain wall system that yields best-in-class thermal performance and exceeds, not only current codes, but also exceeds the most stringent green building codes and standards in the industry today.



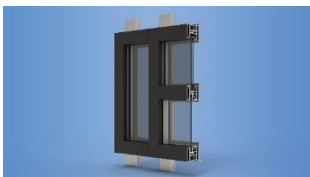
## **YCW 752 2" x 4-7/8", 6-5/8", 7-3/8" Outside Glazed Pressure Wall System**

The YCW 752 is an outside glazed pressure wall system that offers a sight line a mere 2" wide. The system offers a wide variety of face covers and back members of several different depths that may be steel reinforced to suit design requirements. YCW 752 also provides improved thermal performance to conserve energy and lower operating costs.



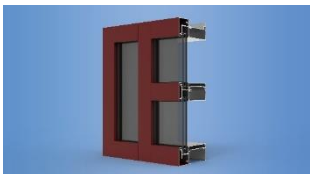
## **YCW 752 OGP 2" x 4-7/8", 6-5/8", 7-3/8" Outside Glazed Curtain Wall System with Polyamide Pressure Plate**

The YCW 752 OGP is an outside glazed pressure wall system that offers a sight line of a mere 2" wide. The system offers a wide variety of face covers and back members of several different depths that may be steel reinforced to suit design requirements. The system utilizes a low conductivity pressure plate made from an industry proven material, Polyamide 6/6.



## **YCW Veneer Wall 2" x 1-7/8", 2-3/8" or 2-1/2" x 3"**

YCW Veneer Wall is a low to mid rise gutter system that is designed to be anchored to the steel structure of a building. Available in either a 2" or 2-1/2" gutter width, YCW Veneer Wall accepts both monolithic and insulated glazing. Optional snap-on battens or face covers are available, depending on the requirements of the architect/designer.



## **YHC 300 IG 3" x 7-1/16", 7-13/16" ProTek® Impact Resistant and Blast Mitigation Inside Glazed Curtain Wall System**

YHC 300 IG is a high-performance curtain wall system designed and tested to meet the most demanding conditions. With varied infill and components, YHC 300 IG can meet the requirements for Impact Resistance, Blast Mitigation, or bot.



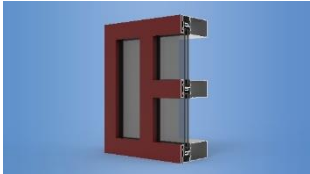
## ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017



### **YHC 300 OG 3" x 7-11/16", 10-1/2" ProTek® Hurricane Impact and Blast Mitigation Curtain Wall System**

YHC 300 OG is a high-performance curtain wall system designed and tested to provide innovative impact and blast solutions for a wide range of applications and design pressures from 45 PSF all the way to 130 PSF.



### **YHC 300 SSG 3" x 6-15/16", 7-11/16" ProTek® Impact Resistant and Blast Mitigating Structural Silicone Glazed Curtain Wall System**

YHC 300 SSG (Structural Silicone Glazed) is a high-performance curtain wall system designed and tested to meet the most demanding conditions. With varied infill and components, YHC 300 SSG can meet the requirements for Impact Resistance, Blast Mitigation or both. Outside or inside glazed.



### **YHC 300 SSG Cassette 3" x 7-7/8" ProTek® Impact Resistant and Blast Mitigating 4-sided Structural Silicone Glazed Curtain Wall System**

The YHC 300 SSG Cassette is a 4-side structural silicone glazed system designed for hurricane impact resistance, blast mitigation or both. Framing is stick built in the field. Shop glazed cassettes interlock with integral adapters on the horizontals to create full width engagement top and bottom. Vertical sides are toggled to the mullions to complete the mechanical attachment in the field.



### **YUW 750 XT/XTH 2-1/2" x 6", 7-1/2" enerGfacade® Unitized Wall System with Superior Performance**

YUW 750 XT/XTH is a unique and versatile unitized wall system designed to curb a building's energy appetite and protect against interior moisture. The system is designed to be assembled and glazed in a climate controlled environment for increased quality assurance of critical seals.



### **YCU 750 TU 3" x 7-1/2" Thermally Broken Unitized Wall System**

The YCU 750 TU is a unique, thermally broken, dry glazed unitized curtain wall system designed for maximum design flexibility. Drop on adjustable slab and slab edge anchors allow rapid job-site dry-in with reduced field labor. Efficient shop assembly is aided by YKK AP's patented screw spline technology.





# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017



## YUW 750 TU 2-1/2" x 7-1/2" Thermally Broken Unitized Wall System

The YUW 750 TU is a unitized wall system designed to be assembled and glazed in a climate controlled environment for increased quality assurance of critical seals. Complete units are then shipped directly to the jobsite permitting rapid installation and dry-in of low to mid-rise commercial buildings. The YUW 750 TU also easily interfaces with sun shades for a greater sustainable design solution.

## Product Average

This EPD covers a weighted average curtainwall product with surface finish. The results for the final product are calculated for the Dublin, GA production site in GA.

## Application

Curtain walling systems are used in buildings.

## Industry Standards

- AAMA 1801, AAMA 501.4, AAMA 501.6, AAMA 507, AAMA 1503, AAMA 501.5, AAMA 501.1
- ASTM E1425, ASTM E90, ASTM E413, ASTM E1332, ASTM E2235, ASTM E283, ASTM E330, ASTM E547
- NFRC 100, NFRC 102, NFRC 200, NFRC 500, ASTM E331,
- ProTek® hurricane and blast mitigation products: TAS 201, TAS 202, TAS 203, ASTM E1886, ASTM E1996, ASTM F1642, UFC 4-010-01

YKK AP® does not test or rate the declared products for extraordinary effects, i.e., performance under unforeseeable influence of fire, water or mechanical destruction.

## Declaration of methodological framework

A “cradle-to-gate with options” analysis using life cycle assessment (LCA) techniques was conducted for this EPD. The analysis was done according to the product category rule (PCR) for Curtain Wall Systems published by the German Institute Construction and Environment (IBU) and followed LCA principles, requirements and guidelines laid out in the ISO 14040/14044 standards.

## Delivery Status

YKK AP® curtain wall systems vary in size depending on the application. They may span from floor to floor, used in punched opening applications, or span multiple floors.



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

## Properties of the product as delivered

**Table 1: Technical product specifications**

Name	Notes*	Value	Unit
Thermal Transmittance (U-Factor) AAMA 1503.1, AAMA 507, and NFRC 100	1, 2, 4	0.28 to 0.40	Btu/hr • ft <sup>2</sup> • °F
Solar Heat-Gain Coefficient (SHGC) NFRC 200	1, 2, 4	0.23 to 0.28	
Condensation Resistance Factor (CRFf) AAMA 1503.1	2, 3, 4	59 to 82	
Water Infiltration** ASTM E331 and AAMA 501.1	2	12 to 20	psf
Air Infiltration** ASTM E283 at 6.24 psf		0.060	cfm/ft <sup>2</sup>
Impact Resistance ASTM E1886/E1996, Testing Application Standard 201/202/203	2, 3, 4	A, D, E	

\* (1) Calculated based on U (Center of Glass) = 0.20 and SHGC (COG) = 0.25 (2) Varies by product type (3) Dependent on glazing specified

(4) Based on products tested

\*\* Predominantly describes the framing

## Material Composition: Base and ancillary Material

Base and Ancillary material for the weighted average product are presented for Curtain Wall product family.

**Table 2: Base and Ancillary material**

Material	Mass [kg]	Mass [%]
Aluminum extrusion profile	6.98E+00	90.36
Aluminum sheet	5.72E-03	0.07
MegaTherm insulation material	3.29E-02	0.43
Nylon 6 compound	1.47E-01	1.90
Polyvinylchloride part (PVC)	1.27E-02	0.16
PP/EPDM-part	4.38E-01	5.67
Rubber sealing compound	3.19E-04	0.00
Silicone sealing compound	3.72E-02	0.48
Stainless steel cold rolled coil	1.23E-03	0.02
Steel part	6.96E-02	0.90
SUM TOTAL PER DECLARED UNIT	7.72E+00	100%

Note: Glazing is excluded from this study.

## Manufacturing

All YKK AP® products are manufactured, finished, and inspected for quality in YKK AP's environmentally certified, state-of-





# ENVIRONMENTAL PRODUCT DECLARATION



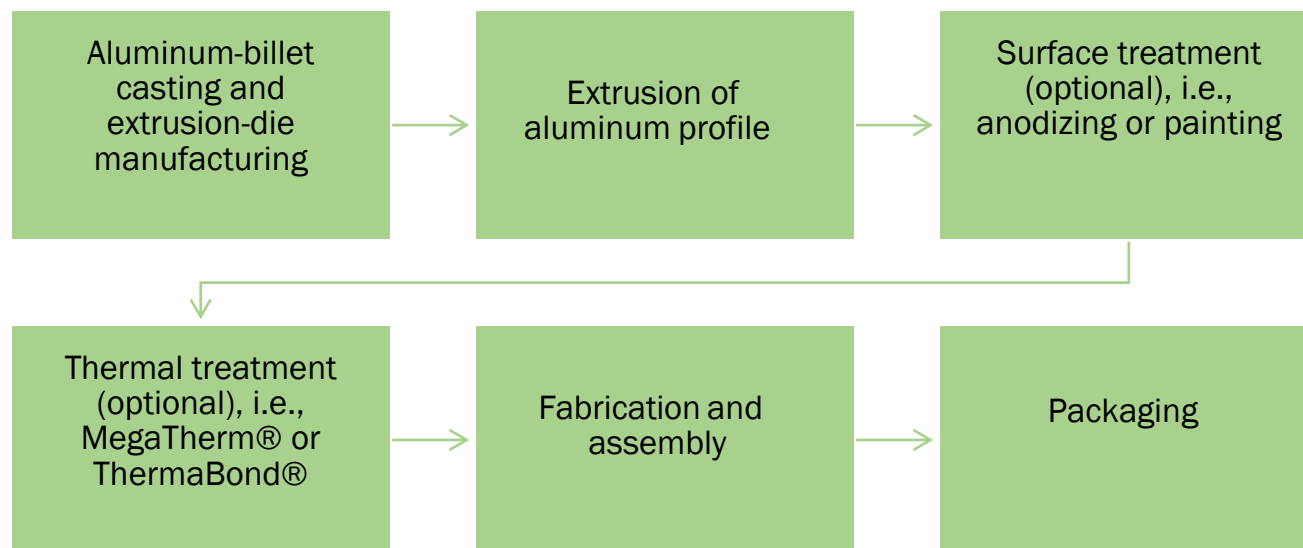
YKK AP America

Aluminum Curtain Wall System

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ISO 21930:2017

the-art facility in Dublin, GA.

The manufacturing process comprises the steps shown below.



The main material input into the YKK AP® manufacturing process is aluminum ingot. The ingot is first alloyed to the desired grade and cast into billets. Subsequently, the billets are extruded into profiles using steel dies that are manufactured on-site. The extruded profiles may then be anodized or painted. Optional thermal treatment, whereby a system is thermally broken, leads into the product's fabrication and assembly. In a last step, the complete assemblies are packed for shipment.

## Packaging

Packaging data were not tracked, and was below the cut-off criteria, therefore, not included in the primary data provided by YKK. The life cycle impact of the overall product would likely be dominated by metals.

## Transportation

Transportation to the customer or construction site is outside the scope of this EPD.

## Product Processing/Installation

Outside of the scope of this EPD (installation stage excluded).

## Use

Outside of the scope of this EPD.

## Reference Service Life, Condition of Use

Outside of the scope of this EPD (use stage excluded).



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

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## Recycling and Disposal

Aluminum extrusions are a highly efficient, sustainable building material. Aluminum is 100% recyclable and can be recycled repeatedly. Recycled aluminum can be identical to smelted aluminum but requires a fraction of energy to manufacture. In building and construction, aluminum scrap has a recycling rate of 95% (UNEP, 2011) (AEC, 2021). The remaining 5% are sent to landfill.

Table 3 Recycling and disposal

Name	Unit
Deconstruction	--
Transportation to the disposal site	100 km by truck
Waste processing	--
Disposal to landfill	5%
Recycling rate of the product	95%
Removals of biogenic carbon	N/A

## Environment and Health

**Product manufacturing:** Plant emissions to air/soil/water are monitored (if applicable) and comply with local laws.

**Product use:** YKK AP® products are not expected to create exposure conditions that exceed safe thresholds for health impacts to humans or flora/fauna under normal operating conditions. Use stage is outside of the scope of this EPD.

## Life Cycle Assessment Background information

A “cradle-to-gate with options” analysis using life cycle assessment (LCA) techniques was conducted for this EPD. The analysis was done according to the product category rule (PCR) for Curtain Walling and followed LCA principles, requirements and guidelines laid out in the ISO 14040/14044 standards. As such, EPDs of construction products may not be comparable if they do not comply with the same PCR. While the intent of the PCR is to increase comparability, there may still be differences among EPDs that comply with the same PCR (e.g., due to differences in system boundaries, background data, etc.).

## Declared Unit

The declared unit for an EPD is 1 sq. meter (1 m<sup>2</sup>) of curtain wall product.

Table 4: Declared unit

Name	Value	Unit
Declared unit	1	m <sup>2</sup>
Conversion factor to kg	7.72	kg/m <sup>2</sup>

## System Boundaries

Per the PCR, this “cradle-to-gate with options” analysis provides information on the Product Stage of the aluminum product life cycle, comprising modules A1–A3, and on the “options” Disposal and Credits, i.e., modules C4 and D. Module C1 and C3



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

are assumed to be zero. End-of-life transportation (C2) is assumed to be 100 km.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)																
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement1	Refurbishment1	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	X	MND	X	X

\* X = module included, MND = module not declared

**Time coverage:** Primary data were collected on production within calendar year 2019. Background data for upstream and downstream processes (i.e., raw materials, energy resources, transportation, and ancillary materials) were obtained from the GaBi CUP 2021.1 databases.

**Technology coverage:** Data were collected for the production of aluminum curtain wall products at YKK AP's manufacturing facility in the United States.

**Geographical coverage:** All YKK AP® products are manufactured in Dublin, Georgia, USA. As such, the geographical coverage for this study is based on United States system boundaries for all processes and products. Whenever US background data were not readily available, European data or global data were used as proxies.

## Estimates and Assumptions

All of the raw materials and energy inputs have been modeled using processes and flows that closely follow actual production data on raw materials and processes. All reported material and energy flows have been accounted for.

Packaging data were not tracked therefore excluded from this EPD.

No significant assumptions have been made beyond the aforementioned.

Proxy data were applied to some materials where no matching life cycle inventories were available, as documented in the background report.

## Cut-off-Criteria

As required by EN 15804 and ISO 21930, in case of insufficient input data or data gaps for a unit process, the cut-off criteria were 1% of renewable and non-renewable primary energy usage and 1% of the total mass input of that unit process. The total of neglected input flows per module was a maximum of 5% of energy usage and mass.



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

Product packaging information and end-of-life transportation are excluded from this study.

In practice, all inputs and outputs for which data were available were included in the calculation. Data gaps were filled by conservative assumptions with average or generic data. Capital items for the production processes (machines, buildings, etc.) were not taken into consideration. No known flows are deliberately excluded from this EPD.

## Period Under Review

Primary data were collected for curtain wall production during the years 2019 and 2020. Background data for aluminum were taken from Aluminum Association (AA) dataset represents aluminum production during 2016. This analysis is intended to represent curtain wall manufacturing in 2019.

## Data Sources

The LCA model was created using the GaBi 10 software system for life cycle engineering, developed by Sphera (Sphera, 2021). Background life cycle inventory data for raw materials and processes were obtained from the GaBi 2021 database (CUP 2021.1). Primary manufacturing data were provided by YKK.

In order to model the life cycle for the production and recycling of the extruded aluminum, the GaBi Professional software system developed by Sphera was used. All relevant background data necessary for the production of extruded aluminum were taken from the GaBi 2021 databases.

Industry average Aluminum Association (AA) dataset for primary Aluminum ingot is used to represent all primary Aluminum in this study.

## Data Quality

A variety of tests and checks were performed by the LCA practitioner throughout the project to ensure high quality of the completed LCA. Checks included an extensive internal review of the project-specific LCA models developed as well as the background data used. A full data quality assessment is documented in the background report.

## Allocation

No multi-output (i.e., co-product) allocation was performed in the foreground system of this study.

Primary data were collected in 2 separate stages. Primary data for different unit processes (casting, extrusion, anodizing, painting, thermal) were provided by YKK for the entire Dublin (GA) facility aggregated for all products. At this stage, inputs and outputs were allocated based on the reference mass flow of each product. In the second set of data, product BOM (bill of materials) were provided for each product including the sales volume for the year of data collection. We calculated the weighted average from each product family based on the sales volume to represent that specific product. No allocation was performed at this stage.

Allocation of background data (energy and materials) taken from the GaBi 2021 databases is documented online at <https://sphera.com/wp-content/uploads/2020/04/Modeling-Principles-GaBi-Databases-2021.pdf>. Also please refer to the 2022 LCA report on semi-fabricated aluminum. for more information: [https://www.aluminum.org/sites/default/files/2022-01/2022\\_Semi-Fab\\_LCA\\_Report.pdf](https://www.aluminum.org/sites/default/files/2022-01/2022_Semi-Fab_LCA_Report.pdf)

Per the PCR guidance, recycling and recycled content in the cradle-to-gate system are modeled using the cut-off rule (a.k.a, the recycled content rule). All materials that are recycled from unit processes are considered to have left the system boundary. Recycled content is modeled in the system only when the percent of recycled content was specified in the material purchase.



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

## Interpreting the Results in Module D

The values in Module D include a recognition of the benefits or impacts related to aluminum recycling which occur at the end of the product's service life. The results included in Module D attempt to capture future benefits and impacts but are based on a methodology that uses current industry-average data reflecting current processes.

The net scrap approach is based on the perspective that material that is recycled into secondary material at end of life is able to substitute an equivalent amount of virgin material. Hence, a 'recycling credit' is given to account for this material substitution. A schematic of the Module D calculation is presented in Figure 1.

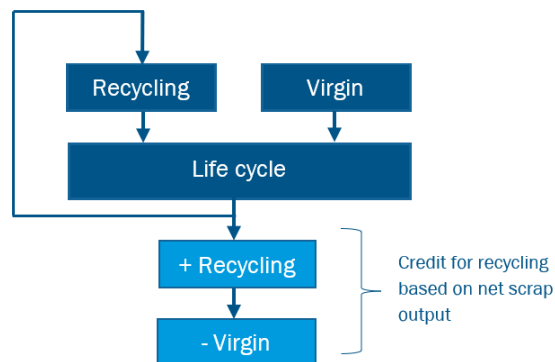


Figure 1: Schematic for the net-scrap approach (credit given at the end-of-life)



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

## Life Cycle Assessment Results

North American life cycle impact assessment (LCIA) results are declared using TRACI 2.1 (Bare, 2012; EPA, 2012) methodology, with the exception of GWP which is reported using the IPCC AR5 (IPCC, 2013) methodology, excluding biogenic carbon. CML-IA v4.8 results are presented as a requirement for the PCR part B. Primary energy use represents the lower heating value (LHV) a.k.a. net calorific value (NCV).

LCIA results are relative expressions and do not predict actual impacts, the exceeding of thresholds, safety margins or risks. The result for the weighted average product are given per the declared unit of 1m<sup>2</sup> of curtain wall system.

**Table 5: Weighted Average Result for Curtain Wall per Declared Unit of 1 m<sup>2</sup>**

Impact Category	Unit	A1	A2	A3	C2	C4	D
<b>LIFE CYCLE IMPACTS ASSESSMENT (LCIA) RESULTS</b>							
<b>IPCC, AR5 (IPCC, 2013)</b>							
Global Warming Potential	kg CO <sub>2</sub> eq.	8.46E+01	5.44E-01	1.54E+01	7.39E-02	4.79E-02	-5.04E+01
<b>CML-IA v4.8</b>							
Abiotic Depletion (ADP elements)	kg Sb eq.	4.12E-05	1.55E-07	1.33E-05	2.42E-08	2.07E-08	-1.87E-05
Abiotic Depletion (ADP fossil)	MJ	8.42E+02	7.04E+00	2.22E+02	1.08E+00	7.17E-01	-4.53E+02
Acidification Potential (AP)	kg SO <sub>2</sub> eq.	3.97E-01	6.72E-03	1.98E-02	1.64E-04	1.88E-04	-2.54E-01
Eutrophication Potential (EP)	kg (PO <sub>4</sub> ) <sup>3-</sup> eq.	2.48E-02	1.44E-03	2.58E-03	5.10E-05	2.52E-05	-1.52E-02
Ozone Layer Depletion Potential (ODP, steady state)	kg R11 eq.	2.43E-12	9.07E-17	5.10E-10	1.54E-17	1.60E-16	-1.70E-14
Photochem. Ozone Creation Potential (POCP)	kg C <sub>2</sub> H <sub>4</sub> eq.	2.05E-02	3.31E-04	2.00E-02	-5.72E-05	1.79E-06	-1.26E-02
<b>TRACI 2.1</b>							
Acidification Potential (AP)	kg SO <sub>2</sub> eq.	3.72E-01	8.61E-03	2.09E-02	2.23E-04	2.04E-04	-2.36E-01
Eutrophication Potential (EP)	kg N eq.	8.85E-03	4.96E-04	1.86E-03	2.55E-05	1.14E-05	-5.23E-03
Ozone Depletion (ODP)	kg CFC 11 eq.	2.43E-12	9.07E-17	5.11E-10	1.54E-17	1.60E-16	-1.70E-14
Resources, Fossil fuels (FF)	MJ surplus energy	7.19E+01	9.40E-01	2.61E+01	1.44E-01	9.32E-02	-3.35E+01
Smog Formation Potential (SFP)	kg O <sub>3</sub> eq.	3.21E+00	2.60E-01	6.96E-01	5.08E-03	3.62E-03	-1.94E+00
<b>RESOURCE USE INDICATORS</b>							
Renewable primary resources used as energy carrier (fuel) (RPRE)	MJ	5.02E+02	1.08E-01	2.85E+01	4.49E-02	6.09E-02	-3.27E+02





# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

Impact Category	Unit	A1	A2	A3	C2	C4	D
Renewable primary resources with energy content used as material (RPR <sub>M</sub> )	MJ	--	--	--	0.00E+00	--	--
Non-renewable primary resources used as an energy carrier (fuel) (NRPRE)	MJ	8.59E+02	7.09E+00	1.99E+02	1.09E+00	7.33E-01	-4.61E+02
Non-renewable primary resources with energy content used as material (NRPRM)	MJ	7.90E-01	0.00E+00	2.80E+01	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels (RSF)	MJ	--	--	--	0.00E+00	--	--
Non-renewable secondary fuels (NRSF)	MJ	--	--	--	0.00E+00	--	--
Recovered energy (RE)	MJ	--	--	--	--	--	--
Secondary material (SM)	kg	4.46E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water resources (FW)	m <sup>3</sup>	1.66E+00	4.02E-04	5.04E-02	1.92E-04	1.01E-04	-1.09E+00
<b>OUTPUT FLOWS &amp; WASTE FLOWS</b>							
Hazardous waste disposed (HWD)	kg	8.35E-07	4.42E-10	2.38E-01	9.11E-11	6.92E-11	-2.80E-07
Non-hazardous waste disposed (NHWD)	kg	3.01E+01	3.89E-04	5.29E-01	1.00E-04	2.18E+00	-1.98E+01
High-level radioactive waste, conditioned, to final repository (HLRW)	kg	8.46E-06	2.24E-08	2.36E-06	3.67E-09	7.06E-09	-3.95E-06
Intermediate- and low-level radioactive waste, conditioned, to final repository (ILLRW)	kg	2.20E-04	6.15E-07	6.49E-05	1.01E-07	1.88E-07	-9.99E-05
Components for reuse (CRU)	kg	--	--	--	--	--	--
Materials for Recycling (MFR)	kg	0.00E+00	0.00E+00	1.08E+00	0.00E+00	0.00E+00	6.64E+00
Materials for Energy Recovery (MER)	kg	--	--	--	--	--	--
Exported Electrical Energy (EEE)	kg	--	--	--	--	--	--
Exported Thermal Energy (EET)	kg	--	--	--	--	--	--

**Comparability:** Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.



ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate and could lead to erroneous selection of materials or products which are higher impact, at least in some impact categories.

When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.

**Additional Results:** Results from the other products in the curtain wall family are presented in the Annex. The results are described separately since their coefficients of variation between results are beyond ±20%

Visualization of Life Cycle Impact Assessment Results

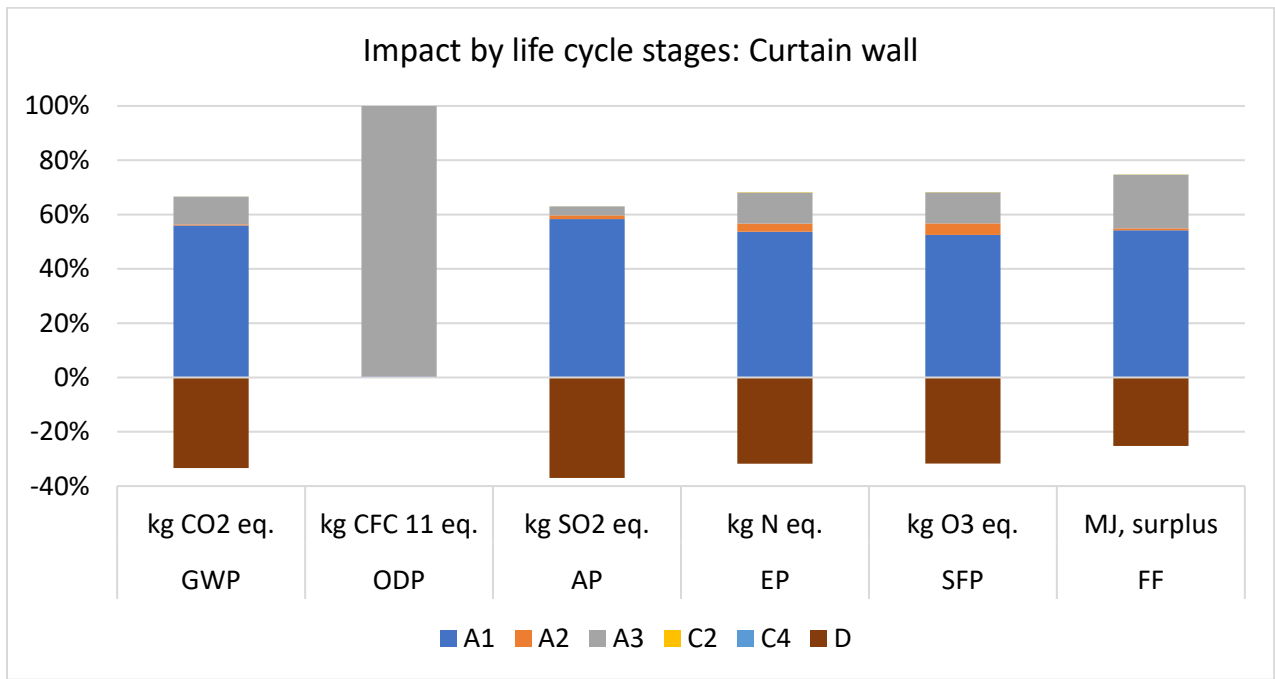


Figure 2: Curtain wall impact results per module



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

## Interpretation

The results represent the cradle-to-gate and disposal environmental performance of the evaluated curtain wall system. As shown in the figure to the right, the results indicate that the impacts are driven by the product stage (modules A1- A3). The primary impact is derived from upstream aluminum production in module A1 (raw material supply). The YKK AP manufacturing processes account for a relatively small part of the manufacturing impact in comparison.

As module D (material credit at the end of life) clearly impacts the results, it is important to note that the applied recycling rate of 95% represents a defensible rate for aluminum extrusion products in the building and transportation sector. This is based on a conservative calculation for global aluminum recycling from these sectors. If a higher rate is used, the credit will increase, thus lowering the total life-cycle impacts. Similarly, a lower recycling rate would raise the total life cycle impacts. As new information becomes available (e.g., the Aluminum Association publishes regional-specific recycling rates), this EPD should be modified to reflect the most current industry conditions.

## Additional Environmental Information

### Environment and Health During Manufacturing

Environmental, occupational health and safety practices are in accordance with OSHA and individual state requirements. The process and the products do not contain any materials or substances for which there exists a route to exposure that leads to humans or flora/fauna in the environment being exposed to said materials or substances at levels exceeding safe health thresholds.

### Further Information

Further information can be found at <https://www.ykkap.com/residential/company/ykk-ap-america-inc/>



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## ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

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# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

## Appendix

Table 6: Results from Curtain Wall YCW 750 OG per Declared Unit of 1 m<sup>2</sup>

Curtain wall YCW 750 OG						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	8.20E+01	5.20E-01	1.47E+01	7.27E-02	5.49E-02	-4.82E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	3.40E-05	1.49E-07	1.27E-05	2.38E-08	2.37E-08	-1.79E-05
ADPf [MJ]	8.30E+02	6.73E+00	2.12E+02	1.06E+00	8.21E-01	-4.34E+02
AP [kg SO2 eq.]	3.81E-01	6.43E-03	1.89E-02	1.61E-04	2.15E-04	-2.43E-01
EP [kg Phosphate eq.]	2.41E-02	1.37E-03	2.47E-03	5.01E-05	2.89E-05	-1.46E-02
ODP [kg R11 eq.]	1.38E-12	8.67E-17	4.88E-10	1.51E-17	1.83E-16	-1.62E-14
POCP [kg Ethene eq.]	1.98E-02	3.17E-04	1.91E-02	-5.62E-05	2.05E-06	-1.20E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	3.58E-01	8.24E-03	2.00E-02	2.19E-04	2.34E-04	-2.26E-01
EP [kg N eq.]	8.67E-03	4.74E-04	1.78E-03	2.51E-05	1.30E-05	-5.01E-03
ODP [kg CFC 11 eq.]	1.38E-12	8.67E-17	4.89E-10	1.51E-17	1.83E-16	-1.62E-14
FF [MJ surplus energy]	7.22E+01	8.99E-01	2.50E+01	1.42E-01	1.07E-01	-3.21E+01
SFP [kg O3 eq.]	3.12E+00	2.49E-01	6.65E-01	5.00E-03	4.15E-03	-1.85E+00
<b>LCI Indicators</b>						
RPRE [MJ]	4.80E+02	1.04E-01	2.72E+01	4.42E-02	6.97E-02	-3.13E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ]	8.48E+02	6.78E+00	1.82E+02	1.07E+00	8.39E-01	-4.41E+02
NRPRM [MJ]	0.00E+00	0.00E+00	3.54E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	4.27E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.58E+00	3.85E-04	4.82E-02	1.89E-04	1.15E-04	-1.04E+00
<b>Output and waste flow</b>						
HWD [kg]	8.31E-07	4.23E-10	2.28E-01	8.96E-11	7.93E-11	-2.68E-07
NHWD [kg]	2.87E+01	3.72E-04	5.06E-01	9.85E-05	2.50E+00	-1.90E+01
HLRW [kg]	8.32E-06	2.14E-08	2.26E-06	3.61E-09	8.09E-09	-3.78E-06
ILRW [kg]	2.16E-04	5.88E-07	6.20E-05	9.93E-08	2.15E-07	-9.56E-05
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	1.03E+00	0.00E+00	0.00E+00	6.35E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--





# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

**Table 7: Results from Curtain Wall YHC 300 OG per Declared Unit of 1 m<sup>2</sup>**

Curtain wall YHC 300 OG						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	8.91E+01	5.92E-01	1.67E+01	7.55E-02	3.03E-02	-5.47E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	3.66E-05	1.69E-07	1.45E-05	2.48E-08	1.31E-08	-2.03E-05
ADPf [MJ]	8.59E+02	7.65E+00	2.41E+02	1.11E+00	4.53E-01	-4.92E+02
AP [kg SO2 eq.]	4.27E-01	7.30E-03	2.15E-02	1.68E-04	1.19E-04	-2.76E-01
EP [kg Phosphate eq.]	2.61E-02	1.56E-03	2.80E-03	5.21E-05	1.59E-05	-1.65E-02
ODP [kg R11 eq.]	7.50E-12	9.85E-17	5.54E-10	1.57E-17	1.01E-16	-1.84E-14
POCP [kg Ethene eq.]	2.17E-02	3.60E-04	2.17E-02	-5.84E-05	1.13E-06	-1.37E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	3.99E-01	9.36E-03	2.27E-02	2.28E-04	1.29E-04	-2.56E-01
EP [kg N eq.]	9.12E-03	5.39E-04	2.02E-03	2.61E-05	7.18E-06	-5.68E-03
ODP [kg CFC 11 eq.]	7.50E-12	9.85E-17	5.55E-10	1.57E-17	1.01E-16	-1.84E-14
FF [MJ surplus energy]	7.09E+01	1.02E+00	2.84E+01	1.48E-01	5.89E-02	-3.64E+01
SFP [kg O3 eq.]	3.36E+00	2.83E-01	7.56E-01	5.19E-03	2.29E-03	-2.11E+00
<b>LCI Indicators</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
RPRE [MJ]	5.41E+02	1.18E-01	3.09E+01	4.59E-02	3.85E-02	-3.56E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ]	8.76E+02	7.70E+00	2.29E+02	1.11E+00	4.63E-01	-5.01E+02
NRPRM [MJ]	0.00E+00	0.00E+00	1.72E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	4.85E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.79E+00	4.37E-04	5.48E-02	1.96E-04	6.36E-05	-1.18E+00
<b>Output and waste flow</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
HWD [kg]	5.45E-07	4.80E-10	2.59E-01	9.31E-11	4.37E-11	-3.04E-07
NHWD [kg]	3.26E+01	4.23E-04	5.75E-01	1.02E-04	1.38E+00	-2.15E+01
HLRW [kg]	8.37E-06	2.43E-08	2.56E-06	3.75E-09	4.46E-09	-4.29E-06
ILRW [kg]	2.16E-04	6.68E-07	7.04E-05	1.03E-07	1.19E-07	-1.08E-04
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	1.17E+00	0.00E+00	0.00E+00	7.21E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

Table 8 Results for Curtain Wall YCW 752 per Declared Unit of 1 m<sup>2</sup>

Curtain wall YCW 752						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	7.18E+01	4.71E-01	1.33E+01	6.31E-02	3.74E-02	-4.36E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	2.92E-05	1.35E-07	1.15E-05	2.07E-08	1.62E-08	-1.62E-05
ADPf [MJ]	7.09E+02	6.10E+00	1.92E+02	9.24E-01	5.60E-01	-3.92E+02
AP [kg SO2 eq.]	3.41E-01	5.82E-03	1.71E-02	1.40E-04	1.47E-04	-2.20E-01
EP [kg Phosphate eq.]	2.09E-02	1.24E-03	2.23E-03	4.35E-05	1.97E-05	-1.32E-02
ODP [kg R11 eq.]	2.68E-12	7.85E-17	4.42E-10	1.31E-17	1.25E-16	-1.47E-14
POCP [kg Ethene eq.]	1.74E-02	2.87E-04	1.73E-02	-4.88E-05	1.40E-06	-1.09E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	3.19E-01	7.46E-03	1.81E-02	1.90E-04	1.59E-04	-2.04E-01
EP [kg N eq.]	7.39E-03	4.29E-04	1.61E-03	2.18E-05	8.88E-06	-4.53E-03
ODP [kg CFC 11 eq.]	2.68E-12	7.85E-17	4.43E-10	1.31E-17	1.25E-16	-1.47E-14
FF [MJ surplus energy]	5.98E+01	8.14E-01	2.26E+01	1.23E-01	7.28E-02	-2.90E+01
SFP [kg O3 eq.]	2.70E+00	2.25E-01	6.02E-01	4.34E-03	2.83E-03	-1.68E+00
<b>LCI Indicators</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
RPRe [MJ]	4.33E+02	9.39E-02	2.47E+01	3.84E-02	4.76E-02	-2.83E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ]	7.24E+02	6.14E+00	1.73E+02	9.31E-01	5.72E-01	-4.00E+02
NRPRM [MJ]	0.00E+00	0.00E+00	2.39E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	3.86E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.43E+00	3.48E-04	4.36E-02	1.64E-04	7.86E-05	-9.41E-01
<b>Output and waste flow</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
HWD [kg]	4.19E-07	3.83E-10	2.06E-01	7.78E-11	5.41E-11	-2.42E-07
NHWD [kg]	2.60E+01	3.37E-04	4.58E-01	8.56E-05	1.70E+00	-1.72E+01
HLRW [kg]	7.06E-06	1.94E-08	2.04E-06	3.14E-09	5.52E-09	-3.42E-06
ILRW [kg]	1.82E-04	5.32E-07	5.61E-05	8.63E-08	1.47E-07	-8.65E-05
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	9.34E-01	0.00E+00	0.00E+00	5.75E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

**Table 9 Results for Curtain Wall YCW 750 SSG per Declared Unit of 1 m<sup>2</sup>**

Curtain wall YCW 750 SSG						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	8.31E+01	5.36E-01	1.51E+01	7.08E-02	3.83E-02	-4.96E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	9.09E-05	1.53E-07	1.31E-05	2.32E-08	1.65E-08	-1.84E-05
ADPf [MJ]	8.06E+02	6.93E+00	2.18E+02	1.04E+00	5.72E-01	-4.46E+02
AP [kg SO2 eq.]	3.94E-01	6.61E-03	1.94E-02	1.57E-04	1.50E-04	-2.50E-01
EP [kg Phosphate eq.]	2.43E-02	1.41E-03	2.54E-03	4.88E-05	2.01E-05	-1.50E-02
ODP [kg R11 eq.]	2.76E-12	8.92E-17	5.02E-10	1.47E-17	1.28E-16	-1.67E-14
POCP [kg Ethene eq.]	2.05E-02	3.26E-04	1.97E-02	-5.47E-05	1.43E-06	-1.24E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	3.69E-01	8.48E-03	2.06E-02	2.13E-04	1.63E-04	-2.32E-01
EP [kg N eq.]	8.73E-03	4.88E-04	1.83E-03	2.44E-05	9.07E-06	-5.15E-03
ODP [kg CFC 11 eq.]	2.76E-12	8.92E-17	5.03E-10	1.47E-17	1.28E-16	-1.67E-14
FF [MJ surplus energy]	6.69E+01	9.25E-01	2.57E+01	1.38E-01	7.44E-02	-3.29E+01
SFP [kg O3 eq.]	3.16E+00	2.56E-01	6.85E-01	4.87E-03	2.89E-03	-1.91E+00
<b>LCI Indicators</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
RPRE [MJ]	5.08E+02	1.07E-01	2.80E+01	4.30E-02	4.86E-02	-3.22E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ]	8.27E+02	6.98E+00	2.12E+02	1.04E+00	5.85E-01	-4.54E+02
NRPRM [MJ]	0.00E+00	0.00E+00	1.11E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	4.39E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.65E+00	3.96E-04	4.96E-02	1.84E-04	8.03E-05	-1.07E+00
<b>Output and waste flow</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
HWD [kg]	1.65E-06	4.35E-10	2.34E-01	8.72E-11	5.53E-11	-2.75E-07
NHWD [kg]	3.01E+01	3.83E-04	5.21E-01	9.59E-05	1.74E+00	-1.95E+01
HLRW [kg]	9.03E-06	2.21E-08	2.32E-06	3.52E-09	5.64E-09	-3.88E-06
ILRW [kg]	2.47E-04	6.05E-07	6.38E-05	9.67E-08	1.50E-07	-9.82E-05
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	1.06E+00	0.00E+00	0.00E+00	6.53E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

**Table 10 Results for Curtain Wall YCW 750 SSG (SplineTech) per Declared Unit of 1 m<sup>2</sup>**

Curtain wall YCW 750 Spline Tech						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	8.48E+01	5.57E-01	1.57E+01	7.46E-02	4.42E-02	-5.16E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	3.44E-05	1.59E-07	1.36E-05	2.44E-08	1.91E-08	-1.92E-05
ADPf [MJ]	8.37E+02	7.20E+00	2.27E+02	1.09E+00	6.62E-01	-4.64E+02
AP [kg SO2 eq.]	4.03E-01	6.88E-03	2.02E-02	1.66E-04	1.73E-04	-2.60E-01
EP [kg Phosphate eq.]	2.47E-02	1.47E-03	2.64E-03	5.14E-05	2.33E-05	-1.56E-02
ODP [kg R11 eq.]	7.01E-14	9.27E-17	5.22E-10	1.55E-17	1.48E-16	-1.73E-14
POCP [kg Ethene eq.]	2.06E-02	3.39E-04	2.05E-02	-5.77E-05	1.65E-06	-1.29E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	3.77E-01	8.81E-03	2.14E-02	2.25E-04	1.88E-04	-2.42E-01
EP [kg N eq.]	8.74E-03	5.07E-04	1.90E-03	2.58E-05	1.05E-05	-5.35E-03
ODP [kg CFC 11 eq.]	7.01E-14	9.27E-17	5.23E-10	1.55E-17	1.48E-16	-1.73E-14
FF [MJ surplus energy]	7.05E+01	9.62E-01	2.67E+01	1.46E-01	8.61E-02	-3.43E+01
SFP [kg O3 eq.]	3.19E+00	2.66E-01	7.12E-01	5.13E-03	3.35E-03	-1.98E+00
<b>LCI Indicators</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
RPRe [MJ]	5.12E+02	1.11E-01	2.91E+01	4.53E-02	5.62E-02	-3.35E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ]	8.54E+02	7.25E+00	2.04E+02	1.10E+00	6.76E-01	-4.72E+02
NRPRM [MJ]	0.00E+00	0.00E+00	2.78E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	4.56E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.69E+00	4.12E-04	5.16E-02	1.94E-04	9.29E-05	-1.11E+00
<b>Output and waste flow</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
HWD [kg]	7.27E-07	4.52E-10	2.44E-01	9.19E-11	6.39E-11	-2.87E-07
NHWD [kg]	3.07E+01	3.98E-04	5.41E-01	1.01E-04	2.01E+00	-2.03E+01
HLRW [kg]	8.31E-06	2.29E-08	2.41E-06	3.71E-09	6.52E-09	-4.04E-06
ILRW [kg]	2.15E-04	6.29E-07	6.63E-05	1.02E-07	1.73E-07	-1.02E-04
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	1.10E+00	0.00E+00	0.00E+00	6.79E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

**Table 11 Results for Curtain Wall YCW 750 XT per Declared Unit of 1 m<sup>2</sup>**

Curtain wall YCW 750 XT						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	9.93E+01	6.43E-01	1.82E+01	8.70E-02	5.50E-02	-5.96E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	4.62E-05	1.84E-07	1.58E-05	2.85E-08	2.38E-08	-2.21E-05
ADPf [MJ]	9.85E+02	8.32E+00	2.63E+02	1.27E+00	8.24E-01	-5.36E+02
AP [kg SO2 eq.]	4.68E-01	7.94E-03	2.35E-02	1.93E-04	2.16E-04	-3.01E-01
EP [kg Phosphate eq.]	2.92E-02	1.70E-03	3.07E-03	6.00E-05	2.89E-05	-1.80E-02
ODP [kg R11 eq.]	7.91E-14	1.07E-16	6.03E-10	1.81E-17	1.84E-16	-2.00E-14
POCP [kg Ethene eq.]	2.41E-02	3.91E-04	2.36E-02	-6.73E-05	2.05E-06	-1.49E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	4.38E-01	1.02E-02	2.49E-02	2.62E-04	2.34E-04	-2.79E-01
EP [kg N eq.]	1.03E-02	5.86E-04	2.21E-03	3.01E-05	1.31E-05	-6.19E-03
ODP [kg CFC 11 eq.]	7.91E-14	1.07E-16	6.04E-10	1.81E-17	1.84E-16	-2.00E-14
FF [MJ surplus energy]	8.40E+01	1.11E+00	3.10E+01	1.70E-01	1.07E-01	-3.96E+01
SFP [kg O3 eq.]	3.76E+00	3.08E-01	8.25E-01	5.98E-03	4.16E-03	-2.29E+00
<b>LCI Indicators</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
RPRE [MJ]	5.90E+02	1.28E-01	3.40E+01	5.29E-02	6.99E-02	-3.87E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPPE [MJ]	9.99E+02	8.37E+00	2.42E+02	1.28E+00	8.41E-01	-5.45E+02
NRPRM [MJ]	5.93E+00	0.00E+00	2.73E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	5.27E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.95E+00	4.75E-04	5.98E-02	2.26E-04	1.16E-04	-1.28E+00
<b>Output and waste flow</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
HWD [kg]	8.07E-07	5.22E-10	2.81E-01	1.07E-10	7.95E-11	-3.31E-07
NHWD [kg]	3.55E+01	4.60E-04	6.26E-01	1.18E-04	2.50E+00	-2.34E+01
HLRW [kg]	9.68E-06	2.65E-08	2.81E-06	4.32E-09	8.11E-09	-4.66E-06
ILRW [kg]	2.50E-04	7.26E-07	7.73E-05	1.19E-07	2.16E-07	-1.18E-04
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	1.27E+00	0.00E+00	0.00E+00	7.85E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--



# ENVIRONMENTAL PRODUCT DECLARATION



YKK AP America

Aluminum Curtain Wall System

According to ISO 14025 and  
ISO 21930:2017

Table 12 Results for Curtain Wall YCW 750 XT IG per Declared Unit of 1 m²

Curtain wall YCW 750 XT IG						
	A1	A2	A3	C2	C4	D
IPCC GWP [kg CO2 eq.]	7.65E+01	4.92E-01	1.40E+01	6.69E-02	4.38E-02	-4.56E+01
<b>CML-IA v4.8</b>						
ADPe [MJ]	3.80E-05	1.40E-07	1.21E-05	2.19E-08	1.89E-08	-1.69E-05
ADPf [MJ]	7.62E+02	6.36E+00	2.02E+02	9.80E-01	6.55E-01	-4.10E+02
AP [kg SO2 eq.]	3.59E-01	6.08E-03	1.81E-02	1.49E-04	1.72E-04	-2.30E-01
EP [kg Phosphate eq.]	2.26E-02	1.30E-03	2.35E-03	4.61E-05	2.30E-05	-1.38E-02
ODP [kg R11 eq.]	1.33E-12	8.19E-17	4.61E-10	1.39E-17	1.46E-16	-1.53E-14
POCP [kg Ethene eq.]	1.86E-02	2.99E-04	1.81E-02	-5.18E-05	1.63E-06	-1.14E-02
<b>TRACI 2.1</b>						
AP [kg SO2 eq.]	3.37E-01	7.79E-03	1.91E-02	2.02E-04	1.87E-04	-2.13E-01
EP [kg N eq.]	7.97E-03	4.48E-04	1.70E-03	2.31E-05	1.04E-05	-4.73E-03
ODP [kg CFC 11 eq.]	1.33E-12	8.19E-17	4.62E-10	1.39E-17	1.46E-16	-1.53E-14
FF [MJ surplus energy]	6.56E+01	8.50E-01	2.37E+01	1.31E-01	8.52E-02	-3.03E+01
SFP [kg O3 eq.]	2.91E+00	2.35E-01	6.32E-01	4.60E-03	3.31E-03	-1.75E+00
<b>LCI Indicators</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
RPRE [MJ]	4.52E+02	9.80E-02	2.62E+01	4.07E-02	5.56E-02	-2.96E+02
RPRM [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPRE [MJ]	7.71E+02	6.41E+00	1.87E+02	9.87E-01	6.70E-01	-4.17E+02
NRPRM [MJ]	7.02E+00	0.00E+00	1.98E+01	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	--	--	--	--	--	--
SM [kg]	4.03E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m3]	1.95E+00	4.75E-04	5.98E-02	2.26E-04	1.16E-04	-1.28E+00
<b>Output and waste flow</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>C2</b>	<b>C4</b>	<b>D</b>
HWD [kg]	4.29E-07	3.99E-10	2.15E-01	8.25E-11	6.33E-11	-2.53E-07
NHWD [kg]	2.72E+01	3.52E-04	4.79E-01	9.08E-05	1.99E+00	-1.79E+01
HLRW [kg]	7.48E-06	2.03E-08	2.16E-06	3.33E-09	6.46E-09	-3.57E-06
ILRW [kg]	1.94E-04	5.56E-07	5.94E-05	9.15E-08	1.72E-07	-9.03E-05
CRU [kg]	--	--	--	--	--	--
MFR [kg]	0.00E+00	0.00E+00	9.75E-01	0.00E+00	0.00E+00	6.00E+00
MER [kg]	--	--	--	--	--	--
EEE [MJ]	--	--	--	--	--	--
EET [MJ]	--	--	--	--	--	--

