ENVIRONMENTAL PRODUCT DECLARATION

Entrances

Oldcastle entrances include glass entrances, swinging and sliding terrace entrances, swing entrances and mall sliders

Entrances consist of door systems that can open inward or outward according to the system and configuration. All swing doors require an opening space.

Sliding glass doors consist of mobile panels that slide open parallel to the building envelope. Therefore, they can open on the inner or outer rail without occupying area.

Oldcastle BuildingEnvelope® is the leading supplier of value-added, glazing-focused interior and exterior products and services in North America. An Oldcastle Building Envelope® team of experts, engineer, test and manufacture solutions to bring building projects to life. This includes curtain wall, skylights, storefronts and entrances, architectural glass, glazing hardware, sun controls, interior partitions and more. With the industry's largest national footprint, Oldcastle Building Envelope® products have been used to achieve sustainability objectives for decades. From providing ample daylighting to improving the thermal performance of buildings, our integrated solutions artfully balance performance and aesthetics.

For more information, visit www.obe.com

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

Oldcastle BuildingEnvelope®

Entrances According to ISO 14025 & EN 15804

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g., Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Solutions
DECLARATION HOLDER	Oldcastle BuildingEnvelope
DECLARATION NUMBER	4789369971.105.1
DECLARED PRODUCT	Entrance Door
REFERENCE PCR	ULE Part A: Life Cycle Assessment Calculation Rules and Report Requirements, v4.0, March 2022 IBU Part B: Requirements on the EPD for Windows and Doors, v.1.7, August 2019
DATE OF ISSUE	September 1, 2023
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	Institut Bauen und Umwelt e.V. (IBU) PCR Review Panel-SVR
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum Cooper McCollum, UL Solutions
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

This EPD conforms with EN 15804.

This EPD was not written to support comparative assertions. Even for similar products, differences in declared unit, use and end-of-life stage assumptions and data quality may produce incomparable results. It is not recommended to compare EPDs with another organization, as there may be differences in methodology, assumptions, allocation methods, data quality such as variability in data sets and results of variability in assessment software tools used.

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Product Description

Description of Company

Oldcastle BuildingEnvelope (OBE), a part of leading global building materials group CRH plc, is the leading supplier of value-added, glazing-focused interior and exterior products and services in North America.

This EPD covers the production of entrance doors. The main production facilities are in Midway, TN and Terrel, TX.

Both Terrell and Midway facilities follow recognized industry standards:

- ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes. This specification includes guidelines regarding chemical compositions, manufacturing practices, mechanical properties and end product testing procedures.
- ASTM B807/B807M – Standard Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys. This specification establishes the controls required for extrusion press solution heat treatment of the 6xxx and 7xxx series aluminum alloys.
- AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum. This specification describes test procedures and requirements for architectural quality aluminum oxide coatings applied to aluminum extrusions and panels for architectural products.
- AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- AAMA 2604 – Voluntary Specification, Performance Requirements and Test Procedures for High Performance Pigmented Organic Coatings on Aluminum Extrusions and Panels. This specification covers high performance organic coatings which are used on products produced by OBE.
- AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Pigmented Organic Coatings on Aluminum Extrusions and Panels. This specification covers superior organic coatings which are used on products produced by OBE.

Recycling Program

Both primary production facilities, Terrell and Midway, have a robust recycling program including both pre-consumer and post-consumer recycled content. On an annual basis, OBE utilizes recycled billet in a minimum of 21% of the aluminum produced. This recycled billet typically contains 50% pre-consumer recycled content and 25% post-consumer recycled content.

Pre-consumer recycled content results from OBE aluminum extrusion production which has built-in scrap that includes a percentage of the billet not extruded to concentrate impurities, end trimmings, startup parts, trimmed anodize rack mark, etc. This scrap is captured and sent to a local remelting facility where the scrap is processed and refined. This material is returned to OBE for use in LEED specified projects along with regular products.

Reuse of Other Waste Streams

OBE also captures other waste streams for reuse, including:

- Incoming paper products (cardboard, kraft paper, office paper) are gathered to be sent to recyclers
- Steel left over from project or maintenance activities is sent into the steel recycling supply chain
- Solvents from the painting process go into a fuels program for cement production
- Various oils from maintenance activities are sent to an oil recycler

Water used in the Anodizing and Paint Pretreatment processes is cleaned in in-house water treatment plants and returned to the environment for reuse. The water meets strict quality standards with monitoring being conducted both in-house and by local regulatory agencies. This water flows back into local reservoirs that support healthy sport fishing hatcheries and regional drinking water sources.

Product Description

OBE's entrance products are manufactured in many sizes, and the composition of the ingredients is based on customer needs and specifications. While multiple products have slightly different compositions, the composition in this EPD is considered representative of the swing and sliding door product lines. It should be noted that the products covered under this EPD are framing systems only and do not include glazing.

The door products are covered by this EPD have been provided in Table 1.

Table 1: Product types with description and graphical representation

Product Type	Description	Representation
All Glass Entrances	OBE's all-glass entrance systems offer architects and designers flexibility to convey the visual impact desired.	
Swinging and Sliding Terrace Entrances	These terrace doors offer performance, durability, and aesthetics. The different models include Terra Swing Access, Terra Swing 62E, and Terra Slide 60E.	
Swing Entrances	These swing entrances are produced in different varieties of framing and hardware configurations. The different models include ArmorDefend Entrance, MS-375TC/WS-500TC thermal composite door and frame, MSD-375 BlastMax, MSD-375/WSD-500 StormMax, NS-212/MS-375/WS-500 Standard Door and Frame, Rugged Door&Frame.	
Mall Sliders	The MS-360 mall sliders are used for interior applications and are economical and easy to install.	

Fig below represents a flow diagram of the processes included in this LCA.

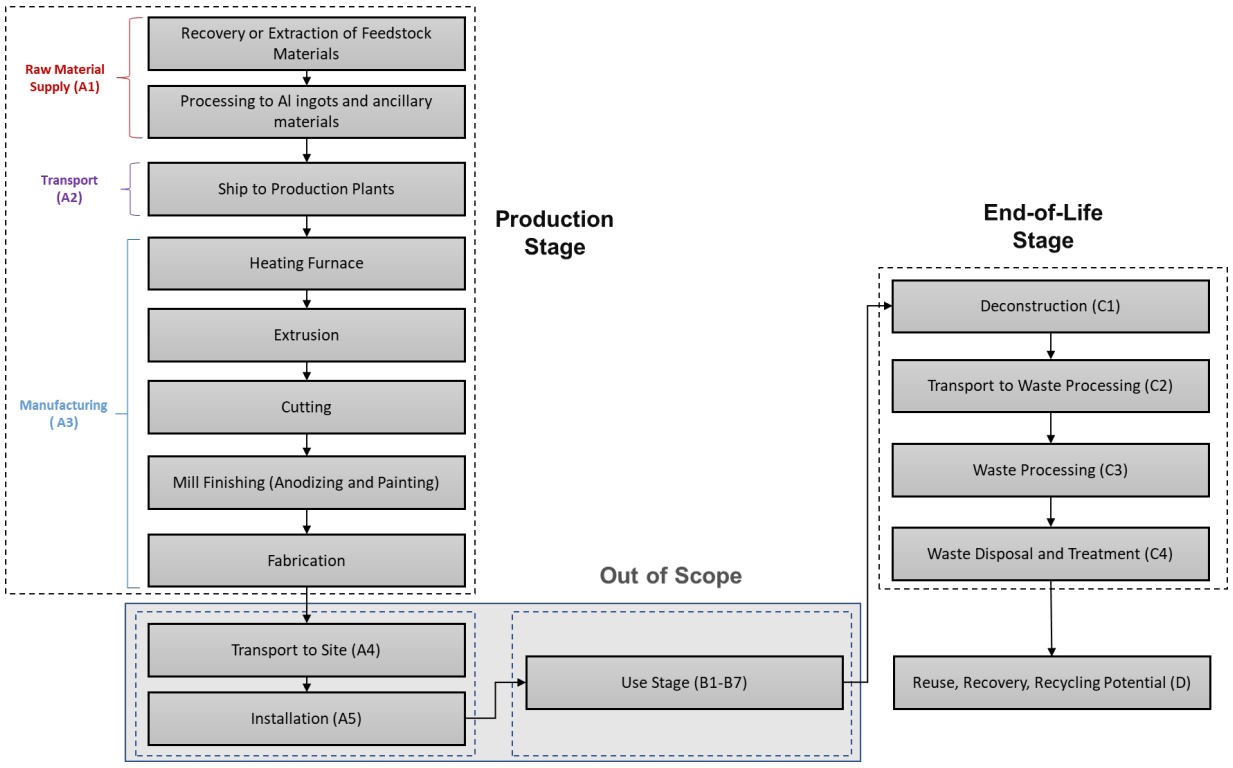

Figure 1: Process Flow Diagram

Application

Oldcastle BuildingEnvelope entrance doors are found either as swinging or sliding doors. These find applications in malls, hotels, office buildings, interior store entrances, airports, museums, and sports arenas. These glass entrance systems offer clean unobtrusive lines in many configurations that complement a wide range of surrounding surfaces.

Technical Data

The PCR's requirement regarding technical information is for a complete window or a door system that includes both framing and glazing. Moreover, most of the technical properties required as per the PCR are for glazing used in a complete window or door system. Since this is a product average EPD that represents a hypothetical entrance framing system without the glazing, no technical information could be obtained for the product.

Delivery Status

The entrance door products dimensions considered in this study is 2.46m X 2.18m with an area of 5.36 m^2. It should be noted that these dimensions represent an average entrance product manufactured by OBE, and the actual quantities may vary based on customer specifications.

Production data collected represented around 97% of total entrances production. The remaining 3% represents products that are manufactured in very small quantities and will have an insignificant contribution to the overall impact. Therefore, an average or a hybrid product formulation was determined to represent the overall production of entrances throughout the calendar year 2019. Inputs to this average product were estimated as the weighted average of all input materials collected for different types of entrance products.

Baseline and Ancillary Materials

Table 2 describes the material composition of entrance doors manufactured by OBE.

Table 2: Entrance Door Composition

Name	Unit
Alum Extrusions	93.24%
EPDM	1.18%
Silicone rubber	0.18%
Silicone sealant	0.06%
Steel	2.86%
Steel (galvanized)	0.20%
Polyamide	0.16%
ABS	0.02%
White Bronze	0.28%
Santoprene	0.01%
Stainless steel	1.70%
Aluminum sheet	0.05%
Flexible PVC (open cell)	0.01%
Rigid PVC (closed cell)	0.05%
Total	**100%**

Manufacture

The manufacturing stage starts with extraction and processing of aluminum ingot and ancillary materials, followed by the transportation of these materials to OBE's plants. Aluminum components used in the window products are manufactured by OBE via extrusion, where the pre-heated aluminum alloy is forced through a die to create an aluminum profile. These profiles are then joined together to form a frame. As aluminum is a good conductor of heat, frames are usually equipped with a thermal barrier to prevent heat transfer between indoors and outdoors. The main processes involved in the development of thermally improved extrusions are pouring, debridging, and strutting. A thermal barrier made from different types of resins is incorporated into the aluminum profiles to allow the indoor and outdoor framing to come together with minimum heat transfer between them. A two-part polymer is dispensed into a strategically placed channel that encapsulates the insulating polymer. This resin subsequently hardens into a strong, structural insulating element.

Environment and Health During Manufacturing

OBE (OBE) is committed to reducing its environmental impact and to the health and safety of its employees. Through their core values, OBE places a responsibility to be accountable for their actions and interactions with the environment and stakeholders. This is emphasized in the code of conduct which includes respecting human rights and the rights of employees in addition to protecting the environment and surroundings through sustainable production processes.

Air: Hazardous air emission releases from the extrusion and finishing processes comply with regulatory thresholds. Additionally, both paint lines utilize technology that destroys over 98% of the volatile organic compounds (VOC) created during the process. No gamma or ionizing radiation emissions are emitted during production or use of the product.

Water/Soil: Pollutants in wastewater discharge comply with regulatory thresholds. See section "Company Description" for details on the added water processing OBE conducts prior to discharging back to the environment. OBE products do not leach any chemicals into water or soil during use.

Noise: Due to adequate acoustical absorption and mitigation devices, measurements of sound levels have shown all values inside and outside the production plant comply with regulatory thresholds.

Product Processing/ Installation

Product installation must be done in accordance with instructions provided by the manufacturer by trained installation technicians, adhering to locally and nationally accepted standards and requirements. The installation stage is however outside the scope of this EPD.

Packaging

Packaging is not included in the system boundary of this EPD since robust data on packaging was not readily available.

Condition of Use

There are no changes in material composition or environmentally relevant material properties over the service life of the product. All materials used in the entrance door product are designed to provide continuous service for the life of all OBE fenestration products.

Environment of Health During Use

There is no harmful emissive potential for Swing Doors or Sliding Glass Windows & Doors. No damage to health or impairment is expected under normal use corresponding to the intended use of the product.

Reference Service Life

This EPD does not cover the product use phase and therefore makes no specific claim as to the typical reference service life.

Extraordinary Effects

Fire: OBE does not test or rate the declared products for performance under unforeseeable influence of fire.

Water: Product contains no substances that would have an impact on water quality during a flooding event.

Mechanical Destruction: No danger to the environment can be anticipated during mechanical destruction.

Re-use Phase

Aluminum is a highly recyclable material that can be recycled repeatedly. In building and construction applications, aluminum at end-of-life has a recycling rate of 95% based on a 2013 Aluminum Association report for aluminum products. Based on the 2013 Aluminum Association report, OBE's aluminum products are assumed to be recycled at the industry average rate of 95% (The Aluminum Association, 2022).

While there is potential for reuse of the extrusions at end-of-life, there is no reuse or take-back program in place for the products currently.

There is no potential for energy recovery from incineration of aluminum extrusions.

Disposal

Using the above assumption at product end-of-life, approximately 5% of extruded aluminum products not recycled are landfilled.

Further Information

For further information, please visit www.obe.com or contact at info@obe.com.

Life Cycle Assessment

Declared Unit

The declared unit is an entrance door measuring 1.23 m x 2.18 m. The weight and associated conversion factor have been provided in Table 3 below.

Table 3: Swing Door and Sliding Glass Window & Door Declared Unit

Name	Value	Unit
Declared Unit	1	1.23 m x 2.18 m
Mass per Declared Unit	35.72	kg
Conversion Factor to 1 kg	0.075	-

System Boundary

As required by the PCR, the system boundary is cradle-to-gate (A1-A3) with required options (C1-C4 and D) as shown in Table 4.

Table 4: Description of the System Boundary

Product			Construction Installation		Use							End-of-Life				Benefits of loads beyond the system boundary		
Raw Material Extraction and Processing	Transport	Manufacturing	Transport	Construction/ Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport	Waste Processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	MND	MND	X

The end-of-life stages C1 and C3 were calculated and were negligible in comparison to the other stages and therefore for the sake of brevity, not included in all tables.

Module A1-A3:

This includes the manufacturing stage of the product. It starts with extraction and processing of aluminum ingot and ancillary materials, followed by the transportation of these materials to OBE's plants. Aluminum components used in the demountable wall product are manufactured by OBE via extrusion, where the pre-heated aluminum

alloy is forced through a die to create an aluminum profile. These profiles are then joined together to form a frame. As aluminum is a good conductor of heat, frames are usually equipped with a thermal barrier to prevent heat transfer between indoors and outdoors. The main processes involved in the development of thermally improved extrusions are pouring, debridging, and strutting. A thermal barrier made from different types of resins is incorporated into the aluminum profiles to allow the indoor and outdoor framing to come together with minimum heat transfer between them. A two-part polymer is dispensed into a strategically placed channel that encapsulates the insulating polymer. This resin subsequently hardens into a strong, structural insulating element.

Module C1-C4:

It is assumed that at product end-of-life, approximately 95% of aluminum content in entrances is recycled. The remaining 5% of aluminum, along with other components, is assumed to be landfilled.

Module D:

Aluminum is a highly recyclable material that can be recycled repeatedly. In building and construction applications, aluminum at end-of-life has a recycling rate of 95% based on a 2022 Aluminum Association report for aluminum products (The Aluminum Association, 2022). Oldcastle BuildingEnvelope's aluminum products are recycled at the industry average 95% rate.

While there is potential for reuse of the extrusions at end-of-life, there is no reuse or take-back program in place for the products at this time.

There is no potential for energy recovery from incineration of aluminum extrusions.

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 rate of aluminum recycling and related processes will evolve over time. The results included in Module D attempt to capture future benefits, or impacts, but are based on a methodology that uses current industry-average data reflecting current processes.

Estimates and Assumptions

This EPD was performed based on company-wide data for the production of OBE entrance doors. As such, the results represent the production of an average OBE entrance product, but do not necessarily represent the results of any individual entrance door produced.

As this study describes OBE's specific manufacturing process, any conclusions or recommendations arising therefrom should not be transferred to other contexts.
The underlying study was conducted in accordance with the PCR. While this EPD has been developed by industry experts to best represent the product system, real life environmental impacts of entrance doors may extend beyond those defined in this document.

Cut-off Criteria

No cut-off criteria are defined for this study. The system boundary was defined based on relevance to the goal of the study. For the processes within the system boundary, all available energy and material flow data were included in the model. In cases where no matching life cycle inventories were available to represent a flow, proxy data was applied based on conservative assumptions regarding environmental impacts.

Background Data

The LCA model was created using the GaBi Software system for life cycle engineering, developed by Sphera (Sphera, 2020). Background life cycle inventory data for raw materials and processes were obtained from the GaBi 2022.2 databases is documented online at https://gabi.sphera.com/support/gabi/gabi-database-2022-lci-documentation/. Primary manufacturing data were provided by OBE.

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 review of project specific LCA models as well as the background data used.

Temporal coverage

The data are intended to represent production of the entrance door during the 2019 calendar year. As such, OBE provided primary data for 12 consecutive months during 2019 for the two facilities in Midway, TN, and Terrel, TX. These data were then used to calculate average production values. All secondary data come from the GaBi 2022 databases and are representative of the years 2011-2022. As the study intended to compare the product systems for the reference year 2019, temporal representativeness is considered to be high.

Geographical coverage

This LCA is based on OBE's entrance doors manufactured in the United States. Background data are representative of the United States, with a few exceptions.

Regionally specific datasets were used to represent each facility's energy consumption. In some cases, proxy datasets were used as needed for raw material inputs to address a lack of data for a specific material or geographic region. European proxy data were used in place of North American secondary aluminum because the European data are more temporally representative, i.e., more recent. Geographical representativeness is considered to be high.

Technological coverage

All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data was unavailable, proxy data were used. The contribution of proxy data is not material to results. Technological representativeness is considered to be high.

Period Under Review

Primary data collected represent production during the 2019 calendar year. This analysis is intended to represent production in 2019.

Allocation

Mass based physical multi-output allocation of foreground processes and data was performed for the product manufactured at each of these two facilities (Module A1-A3). Life cycle inventories were developed based on their production in tons.

Allocation of background data (energy and materials) taken from the GaBi 2022 databases is documented online at https://gabi.sphera.com/support/gabi/gabi-database-2022-lci-documentation/.

End-of-Life allocation generally follows the requirements of ISO 14044, section 4.3.4.3. This study uses the substitution allocation approach and reports credits in module D. Open scrap inputs from the production stage are subtracted from scrap to be recycled at end of life to give the net scrap output from the product life cycle under the net scrap approach. This remaining net scrap is then sent to material recycling and the material credit is received for this net scrap.

Comparability

A comparison is only possible if all data sets to be compared were created according EN 15804 and the same building context, respectively the product-specific characteristics of performance, are considered.

LCA: Scenarios and Additional Technical Information

The relevant technical information for end-of-life of the product has been provided in Table 5. Additional relevant

information for the reuse, recovery and recycling potentials have been shown in Table 6..

Table 5: End of Life (C1-C4)

Name	Value	Unit
Collected separately waste type	32.50	kg
Collected as mixed construction waste	3.22	kg
Reuse	0.00	kg
Recycling	32.50	kg
Energy recovery	0.00	kg
Landfilling	3.22	kg

Table 6: Reuse, recovery and/or recycling potentials (D), relevant scenario information

Mode of Disposal	Value	Unit
Reuse	0.00	kg
Recovery	0.00	kg
Recycling	32.50	kg

Results

Results are reported in accordance with EN 15804+A2. These include environmental impact categories listed in Table 7, resource use indicators listed in Table 9 and output and waste flows listed in Table 10. Additional impact categories for EN 15804+A2 have been listed in Table 11. Biogenic carbon content is less than 5% of the mass of the product for and has been omitted according to section 6.4.4 of EN 15804+A2.

Furthermore, life cycle impact assessment results for North America have been provided in Table 8. Here, the global warming potential is based on based on IPCC AR5 (2013) and the abiotic resource potential for fossil resources is based on CML 2001. The remaining categories are based on characterization factors from the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.1).

The EN15804+A2 results for LCIA categories, resource use and output flows and wastes have been provided in Table 12, Table 14 and Table 15. Results for additional impact categories are shown in Table 16. The North American LCIA results have been provided in Table 13.

LCA results are presented per the declared unit (1 unit of Entrance Door). Note that, at this point, the reported impact categories represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. Life Cycle Impact Assessment (LCIA) results are therefore relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks.

Table 7: Environmental Impact Categories according to EN15804+A2

Indicator	Description	Unit
GWP - total	Climate Change, Global Warming Potential - Total	kg CO_2 eq.
GWP - fossil Fuels	Climate Change, Global Warming Potential - Fossil Fuels	kg CO_2 eq.
GWP - biogenic	Climate Change, Global Warming Potential - Biogenic	kg CO_2 eq.
GWP - luluc	Climate Change, Global Warming Potential - Land Use and Land Use Change	kg CO_2 eq.
ODP	Ozone Depletion Potential, ODP	kg CFC-11 eq.
AP	Acidification Potential, AP	Mole of H+ eq.
EP - freshwater	Eutrophication, EP - Freshwater	kg P eq.
EP - marine	Eutrophication, EP - Marine	kg N eq.
EP - terrestrial	Eutrophication, EP - Terrestrial	Mole of N eq.
POCP - human health	Photochemical Ozone Formation, POCP - Human Health	kg NMVOC eq.
ADPE - mineral, metals	Resource Use, Mineral and Metals	kg Sb eq.
ADPF - fossil	Resource Use, Fossil	MJ
WDP	Water Use	m^3 world equiv.

Table 8: Environmental Impact Categories for North America

Parameter	Description	LCIA Method	Unit
GWP	Global warming potential, fossil	IPCC AR5 (2013)	kg CO_2 eq.
ODP	Stratospheric ozone layer depletion potential	TRACI 2.1	kg CFC 11 eq.
AP	Land and water acidification potential	TRACI 2.1	kg SO_2 eq.
EP	Eutrophication potential	TRACI 2.1	kg N eq.
SFP / POCP	Tropospheric ozone photochemical oxidant (smog) formation	TRACI 2.1	kg O_3 eq.
ADPF	Abiotic resource potential for fossil resources	CML 2001	MJ

Table 9: Resource Use Categories according to EN 15804+A2

Parameter	Description	Unit
PERE	Use of Renewable Primary Energy	MJ
PERM	Primary Energy Resources Used as Raw Materials	MJ
PERT	Total Use of Renewable Primary Energy Resources	MJ
PENRE	Use of Non-Renewable Primary Energy	MJ
PENRM	Non-Renewable Primary Energy Resources Used as Raw Materials	MJ
PENRT	Total Use of Non-Renewable Primary Energy Resources	MJ
SM	Input of Secondary Material	MJ
RSF	Use of Renewable Secondary Fuels	kg
NRSF	Use of Non-Renewable Secondary Fuels	MJ
FW	Use of Net Fresh Water	MJ

Table 10: Output flows and Waste Categories according to EN15804+A2

Parameter	Description	Unit
HWD	Hazardous waste disposed (HWD)	kg
NHWD	Non-hazardous waste disposed (NHWD)	kg
RWD	Radioactive waste disposed (RWD)	kg
MFR	Materials for Recycling (MFR)	kg
CRU	Components for Re-use (CRU)	kg
MER	Materials for Energy Recovery (MER)	kg
EEE	Exported Electrical Energy (EEE)	kg
EET	Exported Thermal Energy (EET)	MJ

Table 11: Additional Impact Categories according to EN 15804+A2

Parameter	Description	Unit
PM	Particulate matter	Disease incidences
IR	Ionising radiation, human health	kBq U235 eq.
ETP-f_w	Ecotoxicity, freshwater	CTUe
HTP-c	Human toxicity, cancer	CTUh
HTP-nc	Human toxicity, non-cancer	CTUh
SQP	Potential soil quality index (Land Use)	Pt

Table 12: LCIA results according to EN15804+A2, entrance door, per door measuring 1.23 m x 2.18 m

Indicator	A1-A3	C3	C2	C3	C4	D	Total
GWP - total	5.36E+02	0.00E+00	2.23E-01	0.00E+00	1.51E+01	-4.48E+02	1.03E+02
GWP - fossil Fuels	5.35E+02	0.00E+00	2.23E-01	0.00E+00	1.51E+01	-4.47E+02	1.03E+02
GWP - biogenic	7.84E-01	0.00E+00	1.71E-04	0.00E+00	8.81E-03	-4.31E-01	3.63E-01
GWP - luluc	7.78E-02	0.00E+00	1.54E-04	0.00E+00	1.54E-02	-6.45E-02	2.89E-02
ODP	4.04E-09	0.00E+00	2.00E-14	0.00E+00	6.76E-11	-8.57E-14	4.10E-09
AP	3.21E+00	0.00E+00	6.64E-04	0.00E+00	5.40E-02	-2.78E+00	4.79E-01
EP - freshwater	5.79E-04	0.00E+00	1.12E-06	0.00E+00	1.40E-05	-1.02E-04	4.92E-04
EP - marine	5.48E-01	0.00E+00	3.22E-04	0.00E+00	2.29E-02	-4.49E-01	1.22E-01
EP - terrestrial	5.98E+00	0.00E+00	3.58E-03	0.00E+00	2.50E-01	-4.90E+00	1.33E+00
POCP - human health	1.62E+00	0.00E+00	6.72E-04	0.00E+00	6.30E-02	-1.34E+00	3.44E-01
ADPE - mineral, metals	1.14E-03	0.00E+00	7.06E-08	0.00E+00	1.56E-06	-5.06E-05	1.09E-03
ADPF - fossil	5.97E+03	0.00E+00	2.89E+00	0.00E+00	2.37E+02	-4.52E+03	1.69E+03
WDP	9.46E+01	0.00E+00	1.31E-02	0.00E+00	6.24E-01	-7.84E+01	1.69E+01

Table 13: LCIA results for North America, entrance door, per door measuring 1.23 m x 2.18 m

Parameter	A1-A3	C3	C2	C3	C4	D	Total
GWP	5.36E+02	0.00E+00	2.22E-01	0.00E+00	1.51E+01	-4.48E+02	1.03E+02
AP	2.68E+00	0.00E+00	6.14E-04	0.00E+00	5.00E-02	-2.31E+00	4.21E-01
EP	8.70E-02	0.00E+00	6.49E-05	0.00E+00	3.17E-03	-6.55E-02	2.47E-02
ODP	5.88E-09	0.00E+00	4.16E-16	0.00E+00	1.31E-10	-1.04E-13	6.01E-09
SFP	3.47E+01	0.00E+00	1.40E-02	0.00E+00	1.18E+00	-2.87E+01	7.21E+00
ADPF	5.00E+02	0.00E+00	4.10E-01	0.00E+00	2.95E+01	-3.38E+02	1.92E+02

Table 14: Resource use results according to EN15804+A2, entrance doors, per door measuring 1.23 m x 2.18 m

Indicator	A1-A3	C3	C2	C3	C4	D	Total
PERE	1.21E+03	0.00E+00	1.20E-01	0.00E+00	1.81E+01	-9.24E+02	3.05E+02
PERM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	1.21E+03	0.00E+00	1.20E-01	0.00E+00	1.81E+01	-9.24E+02	3.05E+02
PENRE	6.00E+03	0.00E+00	3.10E+00	0.00E+00	2.37E+02	-4.53E+03	1.71E+03
PENRM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	6.00E+03	0.00E+00	3.10E+00	0.00E+00	2.37E+02	-4.53E+03	1.71E+03
SM	9.44E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.44E+00
RSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	4.33E+00	0.00E+00	4.33E-04	0.00E+00	2.63E-02	-3.51E+00	8.50E-01

Table 15: Output flows and wastes, according to EN15804+A2, entrance doors, per door measuring 1.23 m x 2.18 m

Indicator	A1-A3	C3	C2	C3	C4	D	Total
HWD	1.72E-01	0.00E+00	1.29E-11	0.00E+00	6.09E-07	-3.26E-06	1.72E-01
NHWD	1.55E+02	0.00E+00	2.66E-04	0.00E+00	1.25E+01	-1.31E+02	3.65E+01
RWD	8.35E-02	0.00E+00	8.58E-06	0.00E+00	7.78E-03	-2.70E-02	6.43E-02
MFR	9.35E+00	0.00E+00	0.00E+00	0.00E+00	3.25E+01	0.00E+00	4.18E+01
CRU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 16: Additional LCIA results according to EN-15804+A2, entrance doors, per door measuring 1.23 m x 2.18 m

Parameter	A1-A3	C3	C2	C3	C4	D	Total
PM	6.43E-05	0.00E+00	8.99E-09	0.00E+00	4.12E-07	-5.94E-05	5.42E-06
IR	9.43E+00	0.00E+00	7.25E-04	0.00E+00	1.24E+00	-4.73E+00	5.94E+00
ETP-fw	2.51E+03	0.00E+00	2.33E+00	0.00E+00	3.51E+01	-1.61E+03	9.32E+02
HTP-c	1.22E-06	0.00E+00	3.74E-11	0.00E+00	1.51E-09	-2.64E-07	9.59E-07
HTP-nc	5.51E-06	0.00E+00	1.51E-09	0.00E+00	6.53E-08	-4.30E-06	1.28E-06
SQP	1.58E+02	0.00E+00	5.65E-01	0.00E+00	2.32E+01	-7.20E+01	1.10E+02

Sensitivity Analysis

A sensitivity analysis was conducted by varying the amount of aluminum extrusions by ±5% for the most relevant LCIA indicators. Results of this sensitivity analysis are shown in Table 17 (absolute values) and Table 18 (relative percentages). The least sensitive impact indicator is resource use (minerals and metals), varying by only +1%. The most sensitive impact indictors included acidification potential, eutrophication potential and smog formation potentials, which showed a variation of ±5%. Therefore, it can be concluded that the LCA model is sensitive to the amount of aluminum extrusions used in the product and that most of the LCIA impacts exhibit a nearly proportional relationship to the amount of aluminum in the product.

Table 17: Absolute sensitivity analysis results for life cycle impact indicators, per door measuring 1.23 m x 2.18 m

Indicator	Unit	Entrance (-5% Al)	Entrance	Entrance (+5% Al)
GWP - total	kg CO2 eq.	2.07E+02	2.17E+02	2.26E+02
GWP - fossil	kg CO2 eq.	2.06E+02	2.16E+02	2.25E+02
AP	kg SO2 eq.	8.74E-01	9.15E-01	9.57E-01
EP	kg N eq.	2.55E-01	2.68E-01	2.80E-01
ODP	kg CFC 11 eq.	1.03E-08	1.08E-08	1.12E-08
POCP	kg O3 eq.	7.05E-01	7.40E-01	7.75E-01
ADPE	MJ surplus energy	2.81E-03	2.85E-03	2.88E-03
ADPF	MJ surplus energy	3.69E+03	3.87E+03	4.04E+03

Table 18: Relative sensitivity analysis results for life cycle impact indicators, per door measuring 1.23 m x 2.18 m

Indicator	Entrance (-5% Al)	Entrance	Entrance (+5% Al)
GWP - total	-4%	0%	4%
GWP - fossil	-4%	0%	4%
AP	-5%	0%	5%
EP	-5%	0%	5%
ODP	-4%	0%	4%
SFP	-5%	0%	5%
ADPE	-1%	0%	1%
ADPF	-5%	0%	5%

LCA: Interpretation

The life cycle impact results for entrances are presented in Figure 2. Most impacts lie within the production stage of the life cycle. Module D burdens are negative due to the credit given for recycling at end-of-life (EOL). Module D credits for ODP are minimal because ODP impact comes predominantly from the production of non-recyclable materials such as polymers and insulation foams, which are assumed to be landfilled and therefore do not receive a material credit in module D.

Modules A1-A3 are responsible for more than 97% of GWP. However, module D credits then reduce the GWP by more than 85% thanks to the highly recycled nature of the materials used.

Since the entrances products are intended to be sold in North America, environmental impact results have been reported for certain impact categories, that are relevant to the North American geography. These impact categories have been listed in Table 8 and the results are shown in Figure 3.

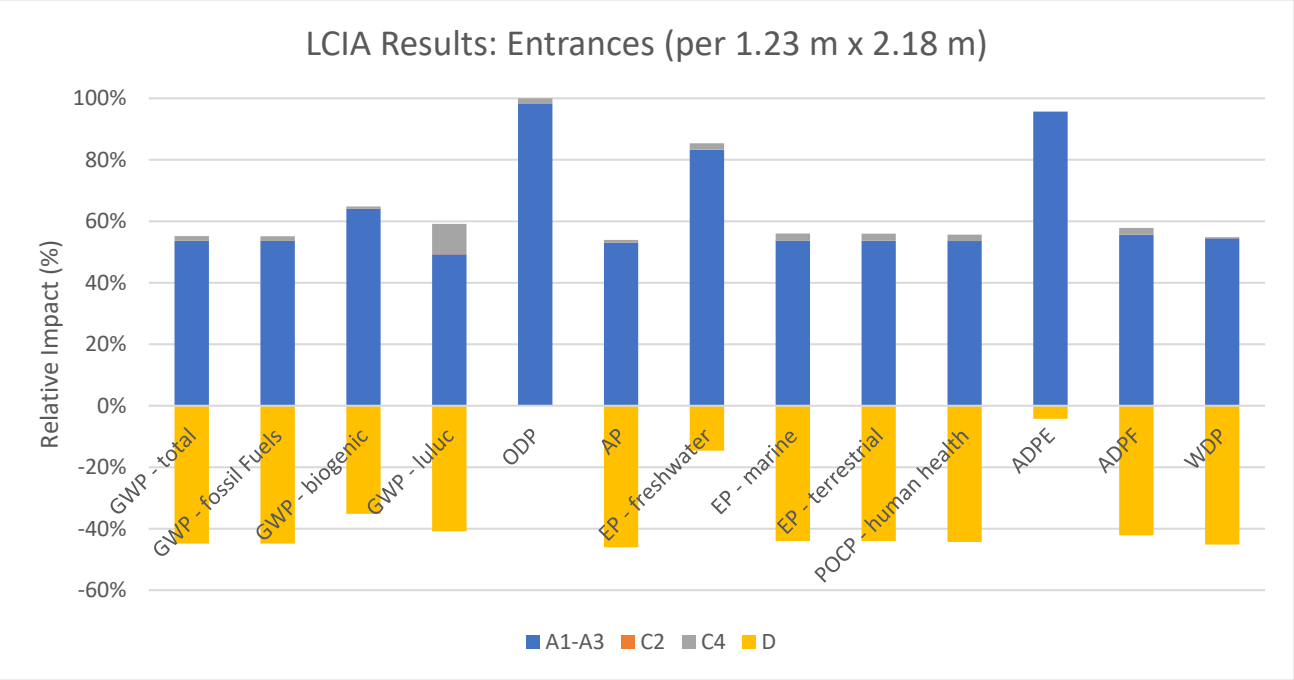

Figure 2: Life Cycle Impact assessment results, entrance doors, per door measuring 1.23 m x 2.18 m

The life cycle resource use results for entrances are presented in Figure 4. As with the LCI results, most resource use occurs during the manufacturing modules A1-A3, with recycling in module D providing an offsetting credit. The exception is the secondary materials use indicator, which does not receive any credit from module D.

As an example, modules A1-A3 are responsible for 96% of the Primary Energy from Non-Renewable Resources (PENRE) impact, which is the largest energy resource use. However, large module D credits from recycling reduce PENRE by 76%.

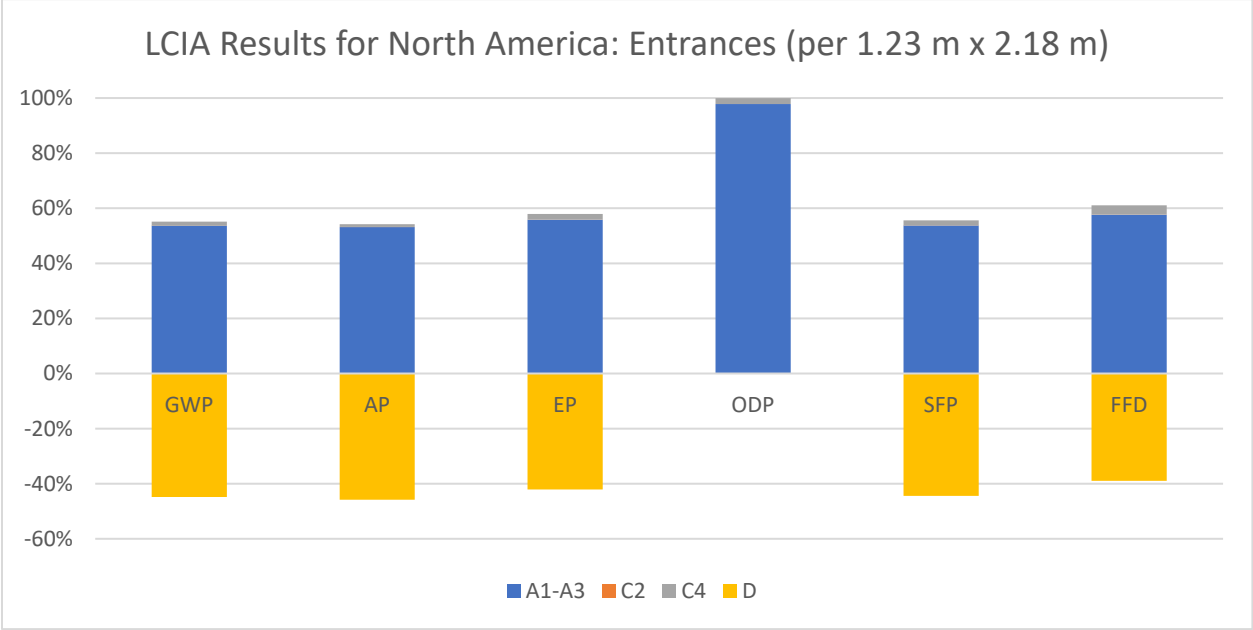

Figure 3: LCIA results for North America, entrance doors, per door measuring 1.23 m x 2.18 m

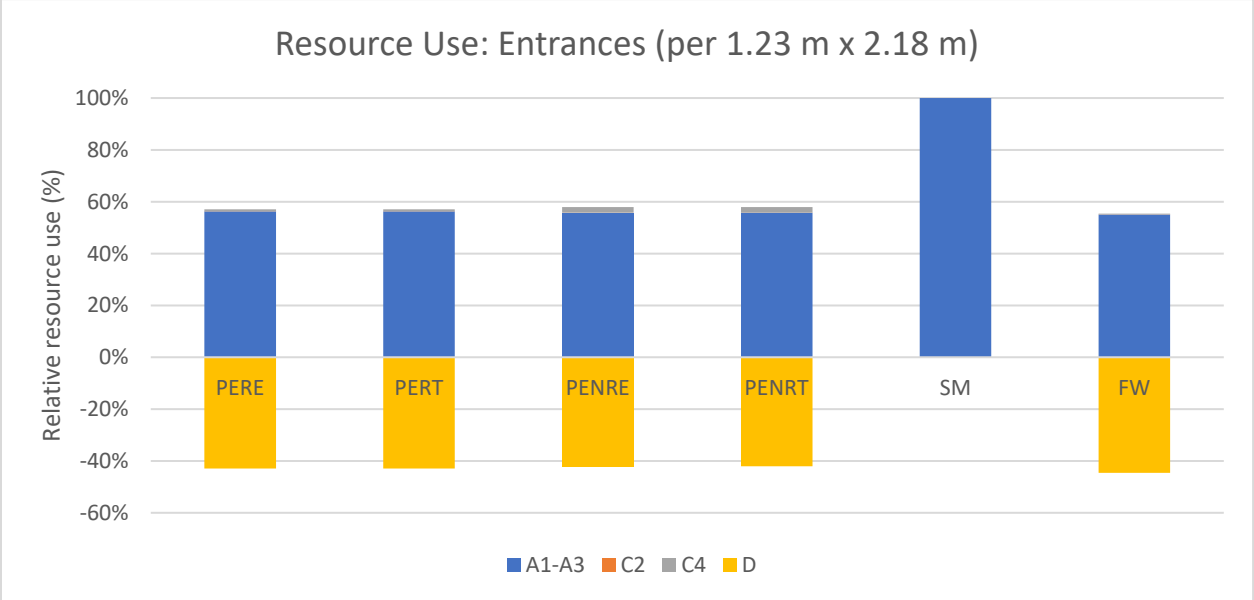

Figure 4: Resource use, entrance doors, per door measuring 1.23 m x 2.18 m

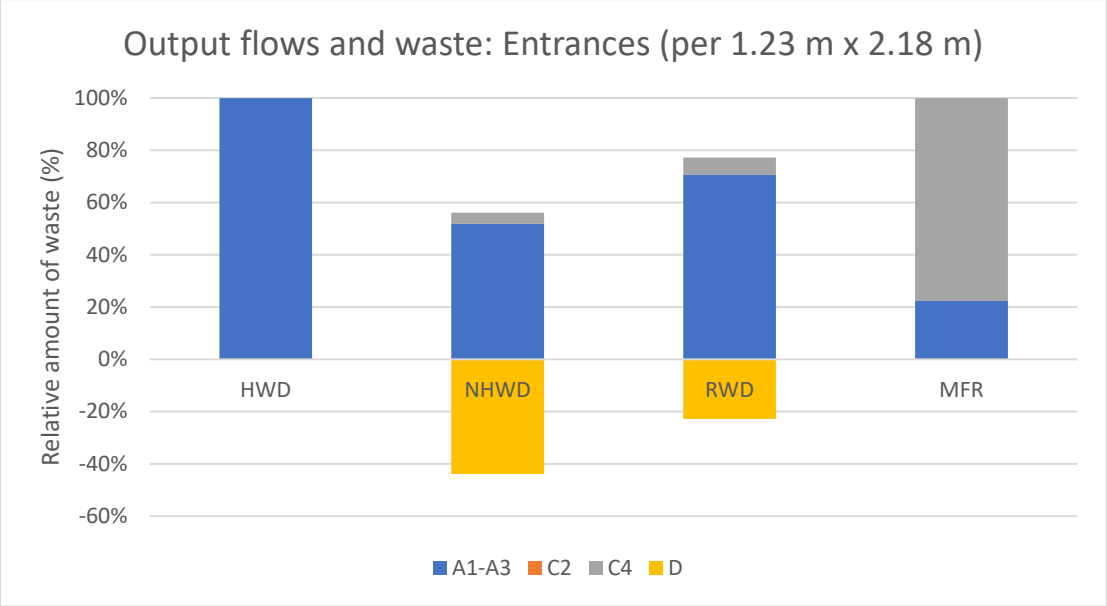

Figure 5: Output flows and waste, entrance doors, per door measuring 1.23 m x 2.18 m

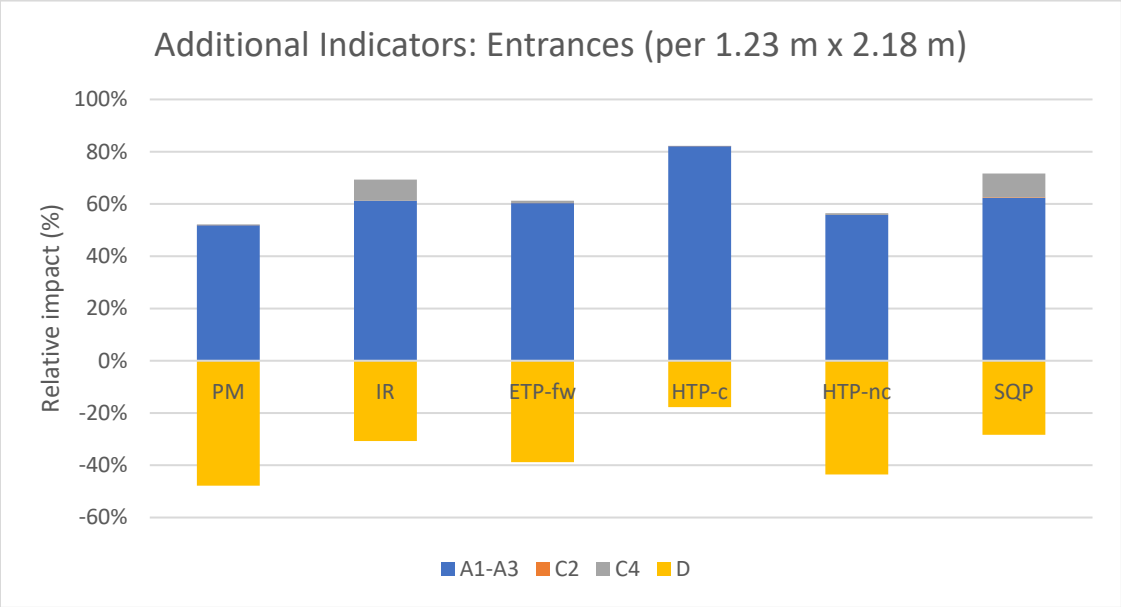

Figure 6: Impact assessment for additional indicators, entrance doors, per door measuring 2.46 m x 2.18 m

The life cycle output flow and waste deposition results for entrances are presented in Figure 5, as required by the PCR.

Additional results for impact categories that are considered optional have also been reported in Figure 6.

It must be noted here that the representative average product measures 2.46 m x 2.18 m, but the LCIA results provided here are per functional unit of 1.23 m x 2.18 m as required by the PCR. Results indicate that higher impacts result from higher weight density per declared unit.

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