

# ENVIRONMENTAL PRODUCT DECLARATION

## LCN

### 4000 SERIES DOOR CLOSERS



*Allegion is pioneering safety by protecting people where they live and work – and protecting our environment at the same time. We promote the health and safety of our employees, customers and local community members worldwide through our commitment to conducting business in a safe and environmentally responsible manner.*

*Additionally, Allegion recognizes the value of the Leadership in Energy and Environmental Design (LEED) rating system to building environmentally safe and sustainable structures. By using Life Cycle Assessment and Environmental Product Declarations, we aim to provide our customers with the information they need to make decisions regarding their own sustainable building concepts and green solutions.*

*At Allegion, we value the importance of a cleaner world and are committed to being a responsible member of our global communities.*



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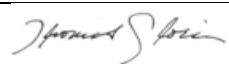


LCN 4000 Series Door Closers

According to ISO 14025

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 Environment
DECLARATION HOLDER	Allegion
DECLARATION NUMBER	4787103471.109.1
DECLARED PRODUCT	LCN 4000 Series Door Closers
REFERENCE PCR	Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Product Group, Builders Hardware UL9004. Version: April 3rd, 2014.
DATE OF ISSUE	March 28, 2016
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:	PCR Review Panel <a href="mailto:epd@ulenvironment.com">epd@ulenvironment.com</a>
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Wade Stout, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas P. Gloria, Industrial Ecology Consultants

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## Product Description

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### Company

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Allegion is a global pioneer in safety and security, with leading brands like aptiQ®, LCN®, Schlage®, Steelcraft® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion produces a range of solutions for homes, businesses, schools and other institutions. Allegion is a \$2 billion company, with products sold in almost 130 countries.

As a subsidiary of Allegion plc, LCN specializes in the manufacture and distribution of door closers for commercial buildings.

### Product

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The 4000 series of products include door closers designed for commercial use. Door closers within this series are ANSI grade 1 products. The LCA for this EPD is based on an average product within the 4000 series line. The product is manufactured at Allegion's Princeton, Illinois plant. Specifically the product is an average product from a single manufacturing plant.

This EPD is representative of manufacturing in the US. It also accounts for international supply chains where relevant.

### Product Characterization

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The product is provided to the customer through a fax, phone, or online system. The product is shipped directly to customers in packaging material that includes cardboard box, shipping labels and plastic materials. The amount of packaging materials are dependent on the size of the customer's order. No ancillary materials are necessary for installation or use. Installation instructions and manuals are provided. These manuals, along with instructional videos, can also be downloaded at [http://us.allegion.com/Products/dr\\_cntrl/service\\_support/Pages/default.aspx](http://us.allegion.com/Products/dr_cntrl/service_support/Pages/default.aspx)

### Technical Information

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**Declared unit:** One average 4000 Series Door Closer.

### Application

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Product is designed for commercial applications. The product falls under the product standard category of ANSI/BHMA A156.4 and has been certified to grade 1.

Additional relevant standards include:

- UL listed for self-closing doors without hold-open under "SWINGING DOOR CLOSERS"(GVEV) file R1943.

Consult factory for other listings such as; cUL, California State Fire Marshal, Bureau of Standards and Appeals.

### Delivery Status

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For shipping, all closers are packaged individually. Packaging includes cardboard, polystyrene foam and paper instructions. These boxes are then packaged into a larger box referred to as a Master Pack. The Master Pack includes 4-6 individually packaged closers.

Average Master Pack dimensions are 15.36" (L) x 10.97" (W) x 10.36" (H).

**Environment**



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## Base Materials

Base materials for products in the 4000 Series Door Closer include:

Material	% of Final Product
Steel	53.21%
Iron	37.41%
PPE	4.10%
Liquid X Oil	3.83%
Nylon Part	<1%
Aluminum Part	<1%
Rubber Part	<1%
Coating	<1%
Adhesive	<1%
<b>Total</b>	<b>100%</b>

## Manufacture

LCN products are manufactured at Allegion's Princeton, Illinois Plant, located at 121 W Railroad Ave, Princeton, IL 61356. The manufacturing of door closers begins when raw materials are received at the plant. Raw material parts are pre-formed by suppliers. Manufacturing can be summarized as finishing of parts, assembly of the final product, packaging and shipping. Product is shipped to customers via UPS or LTL carriers. Natural Resources used in the manufacturing process include electricity, natural gas and water. Steel waste is also generated throughout each step as the product is formed, sheared and assembled. All steel waste is collected and recycled offsite.



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## Environment and Health During Manufacturing

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Allegion and LCN meet all federal and state standards related to the Environment and Health during manufacturing. Additionally LCN employs a strict waste minimization and recycling program that reduces and recycles waste produced in the manufacturing process.

Beyond what is regulated, there are no additional environment and health considerations during the production of goods.

## Packaging

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For shipping, the closer is packaged with an instruction manual, product labels and installation screws in a standard cardboard box. Foam packaging is also included within the box to protect the product during shipping. The box is then closed and sealed with tape. Four to six individual boxes are packaged within a larger box (referred to as a Master Pack). Employees then separate orders. Large orders are palletized on wooden pallets and wrapped in shrink-wrap. Smaller orders are shipped without being palletized.

## Product Installation

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Full installation instructions can be found online at [http://us.allegion.com/Products/dr\\_cntrl/service\\_support/Pages/default.aspx](http://us.allegion.com/Products/dr_cntrl/service_support/Pages/default.aspx)

In general, installation is achieved through the hand tightening of mounting screws that are included with the purchased closer.

## Environment and Health During Use

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There are no environmental or health considerations during the use of the product.

## Re-use Stage

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LCN products may be recycled or reused at the end of life. The LCA that this EPD is created from takes the conservative approach by assuming that all products are disposed of within the system boundary. However, potential recycling is calculated in *Module D – Benefits Beyond System Boundary*.

## Disposal

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It is assumed that all products are landfilled at the end of their life. The distance waste is transported to the landfill is assumed to be 100 miles.

## Further Information

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Additional information regarding Allegion's Sustainability program and environmental legal compliance can be found at <http://us.allegion.com/communities/architects/solutions/Pages/green.aspx>



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## Life Cycle Assessment

### Declared Unit

4000 Series Door Closer

Name	Value (standard units)	Value (Metric Units)
Unit	1 Closer	1 Closer
Weight per Declared Unit, excluding fasteners	10.43 lbs.	4.73 kg
Fasteners (pieces x weight/piece)	.19 lbs.	0.09 kg
Declared Unit	10.62 lbs.	4.82 kg



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## System Boundary

An LCA for products in which a functional life is not declared can be one of three options. These options include a Cradle to Shipping Gate LCA, a Cradle to Building LCA or a Cradle to Building-with EOL Stage LCA.

This particular LCA is a Cradle to Building-with EOL stage LCA.

A summary of the life cycle stages included in this LCA is presented in the following table.

Module Name	Description	Summary of Included Elements
A1	Product Stage: Raw Material Supply	Raw Material sourcing and processing as defined by secondary data.
A2	Product Stage: Transport	Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and mapped distance.
A3	Product Stage: Manufacturing	Energy, water and material inputs required for manufacturing gasketing and thresholds from raw materials. Packaging Materials included as well.
A4	Construction Process Stage: Transport	Shipping from manufacturing site to project site. Fuel use requirements estimated based on product weights and mapped distance.
A5	Construction Process Stage: Installation	Installation and packaging material waste.
B1	Use Stage: Use	Module Not Declared
B2	Use Stage: Maintenance	Module Not Declared
B3	Use Stage: Repair	Module Not Declared
B4	Use Stage: Replacement	Module Not Declared
B5	Use Stage: Refurbishment	Module Not Declared
B6	Use Stage: Operational Energy Use	Module Not Declared
B7	Use Stage: Operational Water Use	Module Not Declared
C1	EOL: Deconstruction	No inputs required for deconstruction.
C2	EOL: Transport	Shipping from project site to landfill. Fuel use requirements estimated based on product weight and mapped distance.
C3	EOL: Waste Processing	Waste processing not required. All waste can be processed as is.
C4	EOL: Disposal	Assumes all products are sent to landfill. Landfill impacts modeled based on secondary data.
D	Benefits beyond system	Recycling benefits of material inputs.



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## Estimates and Assumptions

Finish options – Customers have the choice of purchasing Allegion goods with a variety of finishes. It was determined that a generic finish dataset could be used to represent all finish options. This was determined appropriate based on the relatively low impact of finishing compared to the sourcing of the product's main materials.

Recycled content – Allegion products may contain recycled content, most notably recycled steel and aluminum, which are two of the most recycled materials throughout the globe. The specific amount of recycled content may vary based on the availability of materials to suppliers at the time of sourcing. Data sets sourced from GaBi include assumptions based on typical aluminum and steel recycled content and have been calculated based on expert evaluation and critical review. It was determined appropriate and a conservative approach to use default recycled content values in the GaBi aluminum and steel datasets.

Landfilling at End of Life – All products were considered to be landfilled at end of life. While recycling is an option, the choice of landfilling represents a conservative estimation of the end of life pathway in lieu of having actual verifiable data of end of life recycling.

The inclusion of overhead energy, water and waste data was determined appropriate due to the method in which Allegion tracks energy use.

## Cut-off Criteria

All inputs in which data were available were included.

Material inputs greater than 1% (based on total mass of the individual components of the product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data were available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the declared unit.

List of excluded materials and energy inputs include:

Excluded Material	% of Final Product	Reason for Exclusion
Loctite	.02%	Background data of significant quality not available. Input is well below 1% cut-off level.

- Some material and energy inputs may have been excluded within the GaBi datasets used for this project. All GaBi datasets have been critically reviewed and conform to the exclusion requirement of the PCR.

No hazardous and toxic releases, which are mandatory to be monitored and reported to the U.S TRI, are released from the facility.

## Background Data

All background data was sourced from GaBi databases. GaBi version 6.4.1.20 was used to complete the assessment.





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## Data Quality

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### Geographical Coverage

The geographical scope of the manufacturing portion of the life cycle is Indianapolis, IN. This LCA uses energy, natural resources and material inputs specific to this location. The geographic coverage of primary data is considered excellent.

The geographical scope of the raw material acquisition, customer distribution, site installation and use portions of the life cycle is the global and based on the specific location of each supplier or customer. Locations and shipping distance values were determined through the analysis of purchasing and sales data using GIS mapping software. This data is considered very good.

Disposal and end-of-life geographic coverage (i.e. site of disposal location) are assumed to be 100 miles and based on research relating to the average distance an American lives from a landfill. This data is considered good.

### Time Coverage

Primary data were provided by Allegion associates and represent calendar year 2014. Calendar year 2014 was the most recently completed 12-month period year at the beginning of the study. Using 2014 data meets the PCR requirement that manufacturer specific data be within the last 5 years. Time coverage of this data is considered very good.

Data necessary to model cradle-to-gate unit processes was sourced from thinkstep LCI datasets. Time coverage of the GaBi datasets varies from approximately 2002 to present. All datasets rely on at least one 1-year average data. Overall time coverage of the datasets is considered good and meets the requirement of the PCR that all data be updated within a 10-year period. The specific time coverage of secondary datasets can be referenced in the dataset references table in each supplemental LCA report.

### Technological Coverage

Primary data provided by Allegion is specific to the technology that the company uses in manufacturing their product. It is site specific and considered of good quality. It is worth noting that the energy and water used in manufacturing the product includes overhead energy such as lighting, heating and sanitary use of water. Sub-metering was not available to extract process only energy and water use from the total energy use. Sub-metering would improve the technological coverage of data quality.

Data necessary to model cradle-to-gate unit processes was sourced from thinkStep LCI datasets. Technological coverage of the datasets is considered good relative to the actual supply chain of Allegion. While improved life cycle data from suppliers would improve technological coverage, the use of lower quality generic datasets does meet the goal of this LCA.

## Allocation Procedures

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General principles of allocation were based on ISO14044. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.



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## LCA Results

The following tables disclose the life cycle results for the LCN 4000 Door Closer Line. Impact categories were determined through reference to the BHMA Product Category Rules for Builder Hardware (UL9004).

### TRACI 2.1

Results of the LCA - Environmental Impact, TRACI 2.1										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Air, incl. biogenic carbon	[kg CO <sub>2</sub> -Equiv.]	1.58E+01	5.44E-01	2.64E-01	MND	0.00E+00	6.17E-02	0.00E+00	2.10E+00	-3.74E+00
Ozone Depletion Air	[kg CFC 11-Equiv.]	1.09E-08	4.58E-12	5.32E-13	MND	0.00E+00	5.20E-13	0.00E+00	5.03E-12	1.30E-07
Acidification	[kg SO <sub>2</sub> -Equiv.]	6.18E-02	2.27E-03	8.97E-04	MND	0.00E+00	2.58E-04	0.00E+00	1.36E-02	-9.09E-03
Eutrophication	[kg N-Equiv.]	-4.16E-03	2.16E-04	1.83E-04	MND	0.00E+00	2.45E-05	0.00E+00	5.25E-03	-6.72E-05
Smog Air	[kg O <sub>3</sub> -Equiv.]	7.36E-01	7.04E-02	4.38E-03	MND	0.00E+00	7.99E-03	0.00E+00	3.76E-02	-8.82E-02
Abiotic Depletion for fossil resources	[MJ surplus energy]	1.23E+01	1.02E+00	4.50E-02	MND	0.00E+00	1.15E-01	0.00E+00	4.13E-01	5.77E-01

### CML 2001-April 2013

Results of the LCA - Environmental Impact, CML2001 - Apr. 2013										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential	[kg CO <sub>2</sub> -Equiv.]	1.58E+01	5.44E-01	2.64E-01	MND	0.00E+00	6.17E-02	0.00E+00	2.10E+00	-3.74E+00
Ozone Layer Depletion Potential	[kg R11-Equiv.]	9.36E-09	4.31E-12	5.01E-13	MND	0.00E+00	4.89E-13	0.00E+00	4.73E-12	1.19E-07
Acidification Potential	[kg SO <sub>2</sub> -Equiv.]	8.58E-02	1.76E-03	5.58E-04	MND	0.00E+00	1.99E-04	0.00E+00	4.93E-03	-8.97E-03
Eutrophication Potential	[kg Phosphate-Equiv.]	2.37E-03	4.44E-04	2.38E-04	MND	0.00E+00	5.03E-05	0.00E+00	5.80E-03	-2.50E-04
Photochem. Ozone Creation Potential	[kg Ethene-Equiv.]	8.77E-03	2.13E-04	1.50E-04	MND	0.00E+00	2.41E-05	0.00E+00	1.42E-03	-1.99E-03
Abiotic Depletion	[kg Sb-Equiv.]	1.85E-04	7.04E-08	7.09E-09	MND	0.00E+00	7.99E-09	0.00E+00	8.10E-08	-3.80E-05
Abiotic Depletion for fossil resources	[MJ surplus energy]	2.05E+02	7.51E+00	3.45E-01	MND	0.00E+00	8.52E-01	0.00E+00	3.21E+00	-3.94E+01



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## Resource Use

Results of the LCA - Resource Use										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	MJ, net calorific value	9.12E+00	1.18E-01	1.65E-02	MND	0.00E+00	1.34E-02	0.00E+00	1.79E-01	1.97E+00
PERM	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ, net calorific value	9.12E+00	1.18E-01	1.65E-02	MND	0.00E+00	1.34E-02	0.00E+00	1.79E-01	1.97E+00
PENRE	MJ, net calorific value	2.15E+02	7.55E+00	3.54E-01	0.00E+00	0.00E+00	8.56E-01	0.00E+00	3.30E+00	-3.52E+01
PENRM	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ, net calorific value	2.15E+02	7.55E+00	3.54E-01	MND	0.00E+00	8.56E-01	0.00E+00	3.30E+00	-3.52E+01
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	M <sup>3</sup>	2.90E+00	2.45E-02	8.36E-03	MND	0.00E+00	2.78E-03	0.00E+00	9.37E-02	0.00E+00

Key			
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PENRT	Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)
PERM	Use of renewable primary energy resources used as raw materials	SM	Use of secondary materials
PERT	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	RSF	Use of renewable secondary fuels
PENRE	Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	NRSF	Use of non renewable secondary fuels
PENRM	Use of non renewable primary energy resources used as raw materials	FW	Net use of fresh water



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## Outputs and Waste

Results of the LCA - Waste and Output Flows										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	Kg	4.29E+01	7.02E-02	3.43E-01	MND	0.00E+00	7.96E-03	0.00E+00	4.31E+00	-9.98E+00
RWD	Kg	1.89E-03	1.57E-05	3.49E-06	MND	0.00E+00	1.78E-06	0.00E+00	3.67E-05	-1.25E-03
CRU	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00	0.00E+00
MFR	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00	5.66E+00
MET	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00	0.00E+00
EEE	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00	0.00E+00
EET	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00	0.00E+00

Key			
HWD	Disposed-of-hazardous waste	MFR	Materials for recycling
NHWD	Disposed-of non-hazardous waste	MET	Materials for energy recovery
RWD	Disposed-of Radioactive waste	EEE	Exported electrical energy
CRU	Components for reuse	EET	Exported thermal energy

## Comparability of EPDs

Results presented in this EPD are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Results are not intended to be used to determine superiority of one product over another.

Environmental declarations from different programs may not be comparable.



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## Life Cycle Assessment Interpretation

A Dominance Analysis evaluates each life cycle stage and compares the impacts from that stage to the sum of the impacts calculated for all declared modules. A Dominance Analysis was completed for the TRACI and CML results. Module D was excluded from the Dominance Analysis.

The dominance analysis shows that the Production Stage (A1-A3) of the life cycle is responsible for the vast majority of impacts (80%-90%, on average) across all impact categories. A1-A3 includes the extraction, processing, and sourcing of all materials.

It is important to note that data quality may have an impact on the results of an LCA. Overall data quality is considered good. Improvements can be made through the modification of datasets to incorporate more regional specificity, both in terms of energy and technology. Additionally, the extrusion of both metals and plastics were treated using a generic dataset linked to region specific energy, water and waste data. Utilizing Allegion-specific upstream data provided by suppliers would lead to improvement in data quality. However the data used in this assessment was considered appropriate in relation to the goal, scope and budget of the project.

## References

1. Life Cycle Assessment, Allegion, Core LCA Report for Product Groups Under BHMA PCR. WAP Sustainability Consulting. Oct. 2015.
2. Life Cycle Assessment, Schlage, Supplemental LCA Report for LCN Closers: 4000 Series, 1460 Series. WAP Sustainability Consulting. Oct. 2015.
3. Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Product Group, Builders Hardware UL9004. Version: April 3<sup>rd</sup>, 2014.
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.

