



**Product Category Rule (PCR)
for Preparing an
Environmental Product Declaration (EPD)
for Product Group**

**Builders Hardware
UL 9004**

**VERSION April 3rd, 2014
VALID THROUGH (April 3rd, 2019)**

PRODUCT CATEGORY RULE

Builders Hardware

Versions overview

Version	Description	History
1	Version by UL Environment with input from a coalition was accepted by the review panel	February 10 th , 2014

Editor's Notes:

This proposed **PCR** is based on modifications made to existing **PCRs** from other countries that address **BUILDERS HARDWARE**. In an effort to harmonize this **PCR** with existing **PCRs**, the **PCR** Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), *Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, Sep 2011* and Part B: Requirements on the EPD for locks and fittings, July 2013 were used as references.

This **PCR** was modified to reflect the North American circumstances, conformity with existing **BUILDERS HARDWARE** standards, and conformity with reference standards (ISO 21930, EN 15804). Revisions/discussion points to make this **PCR** applicable to the U.S. include: **UNITS, FUNCTIONAL UNIT**, impact assessment methods, testing methods and requirements, use phase options, references, and standards.

This **PCR** is intended to serve the global B2B and B2C markets, reflecting the global manufacturing and distribution networks for these products. It is expected that region-specific versions of this **PCR** will not differ significantly.

* * * * *

PROGRAM OPERATOR: *UL Environment*

The **PCR** has been prepared by UL Environment with input from a coalition of the following interested parties:

*BHMA
ASSA ABLOY
Allegion
Stanley Security Systems*

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The **PCR** peer review report is available upon request at epd@ulenvironment.com.

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Definitions

For the purposes of this document, the following terms and definitions are per ANSI/BHMA A156.1-115, ISO 14040:2006, ISO 14044, 14025: 2006, ISO 21930 and EN 15804 apply.

ANCILLARY INPUT – input material or product that is used by a **UNIT PROCESS** during the life cycle of the **BUILDERS HARDWARE** product, but which does not constitute part of the **BUILDERS HARDWARE** product [adjusted from ISO 14040 and EN 15804].

AVERAGE DATA – data representative of a product, product group or construction service, provided by more than one supplier [EN 15804].

BUILDERS HARDWARE PRODUCT CATEGORY – a collection of products that are used to secure, control access, control motion, protect openings from damage, provide safe passage to users, seal and provide functional or non-functional decorative elements allowing code compliant solutions for swing- and sliding-door openings in buildings. For purposes of this PCR, **BUILDERS HARDWARE PRODUCT CATEGORY** consists of 26 sub-categories shown in Table 1. A sub-category of **BUILDERS HARDWARE** also addresses the needs of cabinet hardware.

COMPARATIVE ASSERTION – environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function [ISO 14044].

CO-PRODUCT – any of two or more products coming from the same **UNIT PROCESS** or **PRODUCT SYSTEM** [ISO 14044].

DECLARED UNIT – quantity of a **BUILDERS HARDWARE** product for use as a **REFERENCE UNIT** in an EPD for an environmental declaration based on one or more **INFORMATION MODULES** [EN 15804 adapted from ISO 21930]; For specific examples refer to Table 1. See also **FUNCTIONAL UNIT**. The **DECLARED UNIT** is used where the **FUNCTIONAL UNIT** and the reference scenario for the whole life cycle, on the building level, cannot be stated.

DOMINANCE ANALYSIS – an analytical quantitative (such as statistical) or qualitative ranking technique (such as ABC analysis), by means of which the relative significance of contributions are examined [adjusted from ISO 14044].

DUMMY – term used by US LCI database that refers to “empty” LCI data sets in technosphere processes.

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ESTIMATED SERVICE LIFE (ESL) – The average **ESL** of a building in North America is defined to be 60 years.

FUNCTIONAL UNIT – quantified performance of a **PRODUCT SYSTEM** for a building product for use as a **REFERENCE UNIT** in an EPD based on **LCA** [ISO 21930 adapted from ISO 14040].

INFORMATION MODULE – compilation of data to be used as a basis for a **TYPE -III ENVIRONMENTAL DECLARATION** covering a **UNIT PROCESS** or a combination of **UNIT PROCESSES** that are part of the life cycle of a product [ISO 14025].

INTEGRATED BUILDING TECHNICAL SYSTEM (IBTS) – comprise installed technical equipment supporting operation of a building. This includes technical building system for HVAC, lighting, domestic hot water and other system for sanitation, security, fire safety, internal transport and building automation and control and IT communication [EN 15804]. Some **BUILDERS HARDWARE** products may be part of the security, fire-safety, and other aspects of **IBTS**.

LIFE CYCLE ASSESSMENT, LCA – compilation and evaluation of the inputs, outputs and the potential environmental impacts of a **PRODUCT SYSTEM** throughout its life cycle [ISO 14044].

LIFE CYCLE INVENTORY, LCI – phase of **LIFE CYCLE ASSESSMENT** involving the compilation and quantification of inputs and outputs for a product throughout its life cycle [ISO 14040].

LIFE CYCLE IMPACT ASSESSMENT, LCIA – phase of **LIFE CYCLE ASSESSMENT** aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a **PRODUCT SYSTEM** throughout the life cycle of the product [ISO 14040].

NON-RENEWABLE ENERGY – energy from sources which are not defined as **RENEWABLE** energy sources [EN 15804]

NON-RENEWABLE RESOURCE – resource that exists in a finite amount that cannot be replenished on a human time scale [ISO 21930].

PCR REVIEW – process whereby a **THIRD PARTY** verifies the **PRODUCT CATEGORY RULE** [ISO 14025].

PRODUCT CATEGORY RULE, PCR – set of specific rules, requirements and guidelines for developing **TYPE III ENVIRONMENTAL DECLARATIONS** for one or more product categories [ISO 14025].

PRODUCT SYSTEM – collection of **UNIT PROCESSES** with elementary and product flows, performing one or more defined functions, and which models the life cycle of the product [ISO 14040]

PROGRAM OPERATOR– body or bodies that operate a **TYPE -III ENVIRONMENTAL DECLARATION** program [ISO 14025].

*Note: A **PROGRAM OPERATOR** can be a company or a group of companies, industrial sector or trade association, public authorities or agencies, or an independent scientific body or other organization.*

REFERENCE UNIT - measure of the outputs from processes in a given **PRODUCT SYSTEM** required to fulfil the function expressed by the **FUNCTIONAL UNIT** [ISO 14044] over the **ESL** of the building or the **RSL** of the **BUILDERS HARDWARE** product .

*Note: In ISO Standards, Reference Unit and **REFERENCE FLOW** are used interchangeably. In this PCR only **REFERENCE UNIT** is used.*

REFERENCE SERVICE LIFE, RSL – service life of a **BUILDERS HARDWARE** product which is known to be expected under a particular set, i.e., a reference set, of in-use conditions and which may form the basis of estimating the service life under other in-use conditions [ISO 21930].

REFERENCE SERVICE LIFE DATA, RSL DATA – Information that includes the **RSL** and any qualitative or quantitative data describing the validity of the **RSL**. Example- typical data describing the validity of the **RSL** include the description of the component for which it applies [ISO 15686-8].

RENEWABLE ENERGY – energy from **RENEWABLE** non-fossil sources [EN 15804].

Examples: wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.

RENEWABLE RESOURCE – Resource that is grown, naturally replenished or naturally cleansed, on a human time scale [ISO 21930].

*Note: A **RENEWABLE RESOURCE** is capable of being exhausted, but may last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grassland, fertile soil.*

SECONDARY FUEL – fuel recovered from previous use or from **WASTE**, which substitutes primary fuels [EN 15804].

*Note 1: Processes providing a **SECONDARY FUEL** are considered from the point where the **SECONDARY FUEL** enters the system from the previous system.*

*Note 2: Any combustible material recovered from previous use or from **WASTE** from the previous **PRODUCT SYSTEM** and used as fuel in a following system is a **SECONDARY FUEL**.*

Note 3: Examples for primary fuels are: coal, natural gas, biomass, etc.

*Note 4: Examples for **SECONDARY FUELS** recovered from previous use or as **WASTE** are: spent solvents, wood from demolition or forest slash or as bark or sawdust, tires, used motor or cooking oil, and animal fats.*

SECONDARY MATERIAL – material recovered from previous use or from **WASTE**, which substitutes primary materials [EN 15804].

*Note 1: **SECONDARY MATERIAL** is measured at the point where the **SECONDARY MATERIAL** enters the system from another system.*

*Note 2: Materials recovered from previous use or from **WASTE** from one **PRODUCT SYSTEM** and used as an input in another **PRODUCT SYSTEM** are **SECONDARY MATERIALS**.*

*Note 3: Examples for **SECONDARY MATERIALS** (to be measured at the system boundary) are recycled scrap metal, crushed concrete, glass cullet, recycled wood chips, recycled plastic.*

THIRD PARTY – person or body that is recognized as being independent of the parties involved, as concerns the issues in question. Note-"parties involved" are usually supplier ("first party") and purchaser ("second party") interests [ISO 14024].

TYPE III ENVIRONMENTAL DECLARATION – Environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information [EN 15804: adapted from ISO 14025].

Note: The calculation of predetermined parameters is based on the ISO 14040 series of standards, which is made up of ISO 14040, and ISO 14044. The selection of the predetermined parameters is based on ISO 21930.

UNIT - the set of the fewest **BUILDERS HARDWARE** elements which comprise one complete **BUILDERS HARDWARE** product, together with the fasteners required to affix the product to the building. More than one **UNIT** may be required in use, but less than one **UNIT** cannot perform the required function.

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UNIT PROCESS – the smallest element considered in the LCI for which input and output data are quantified [ISO 14040].

WATER CONSUMPTION – water removed from but not returned to the same drainage basin

*Note 1: **WATER CONSUMPTION** can be because of evaporation, transpiration, product integration or discharge into a different drainage basin or the sea. Evaporation from reservoirs can be included in **WATER CONSUMPTION** [ISO/DIS 14046].*

Note 2 Refer to ISO 14046 for all terms relating to types and classifications of water and water footprint assessment.

WASTE – substances or objects that the holder intends or is required to dispose of [ISO 14040].

References

1. General Standards for BUILDERS HARDWARE Products

Manufacturing and Product Standards

- ANSI/BHMA A156.1-2013 Butts & Hinges
- ANSI/BHMA A156.2-2011 Bored and Preassembled Locks and Latches
- ANSI/BHMA A156.3-2008 Exit Devices
- ANSI/BHMA A156.4-2008 Door Controls - Closers
- ANSI/BHMA A156.5-2010 Cylinders and Input Devices for Locks
- ANSI/BHMA A156.6-2010 Architectural Door Trim
- ANSI/BHMA A156.8-2010 Door Controls - Overhead Stops and Holders
- ANSI/BHMA A156.9-2010 Cabinet Hardware
- ANSI/BHMA A156.11-2010 Cabinet Locks
- ANSI/BHMA A156.12-2013 Interconnected Locks & Latches
- ANSI/BHMA A156.13-2012 Mortise Locks & Latches
- ANSI/BHMA A156.14-2013 Sliding and Folding Door Hardware
- ANSI/BHMA A156.15-2011 Release Devices: Closer Holder, Electromagnetic and Electromechanical
- ANSI/BHMA A156.16-2008 Auxiliary Hardware
- ANSI/BHMA A156.17-2010 Self Closing Hinges & Pivots
- ANSI/BHMA A156.20-2012 Strap and Tee Hinges and Hasps
- ANSI/BHMA A156.21-2009 Thresholds
- ANSI/BHMA A156.22-2012 Door Gasketing and Edge Seal Systems
- ANSI/BHMA A156.23-2010 Electromagnetic Locks
- ANSI/BHMA A156.24-2012 Delayed Egress Locking Systems
- ANSI/BHMA A156.25-2007 Electrified Locking Devices
- ANSI/BHMA A156.26-2012 Continuous Hinges
- ANSI/BHMA A156.29-2012 Exit Locks, Exit Locks with Exit Alarms, Exit Alarms, Alarms for Exit Devices
- ANSI/BHMA A156.30-2007 High Security Cylinders
- ANSI/BHMA A156.31-2007 Electric Strikes and Frame Mounted Actuators
- ANSI/BHMA A156.36-2010 Auxiliary Locks

Installation Stage

- ANSI/BHMA A156.7-2009 Template Hinge Dimensions
- ANSI/BHMA A156.115-2006 Hardware Preparation in Steel Doors or Steel Frames
- ANSI/BHMA A156.115w-2006 Hardware Preparation in Wood Doors with Wood or Steel Frames

2. General and Building Sector Specific ISO Standards and others for LCA, PCR and EPDs

ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework

ISO 14044: 2006 Environmental management -- Life cycle assessment -- Requirements and guidelines

ISO 14025: 2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

ISO/DIS 14046:2013, Environmental management- Water footprint- Principles, requirements and guidelines

ISO 15392:2008, Sustainability in building construction- General principles

ISO 15686-1:2011, Buildings and constructed assets- Service life planning- Part 1: General principles

ISO 15686-8:2008, Buildings and constructed assets- Service life planning Part 8: Reference service life and service life estimation

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

EN 15804: 2012 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products

3. Federal Standards and SOPs

40 CFR 50 Protection of Environment - Part 50: National Primary and Secondary Ambient Air Quality Standards (U.S) (<http://www.epa.gov/air/criteria.html>)

CAA 112(r) Clean Air Act (U.S)
(http://www.epa.gov/oem/docs/chem/caa112_rmp_factsheet.pdf)

CERCLA Hazardous Substances (U.S)
(<http://www.epa.gov/oem/content/hazsubs/cercsubs.htm>)

EPCRA 313 Toxic Release Inventory Reporting (U.S)
(<http://www.ecy.wa.gov/ePCRA/section313.html>)

OSHA 1910.1200 Hazardous Communication Standard—Toxic and Hazardous Substances (U.S) (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099)

U.S EPA, ORD/NRMRL/Sustainable Technology Division, Systems Analysis Branch, SOP No. S-10637-OP-1-0- Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI), Software Name and Version Number: TRACI version 2.1, USER'S MANUAL, 24 July, 2012

4. Relevant PCRs

Product Category Rules for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU): Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, Sep 2011

PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), *Part B: Requirements on the EPD for locks and fittings, July 2013*

Institute Construction and Environment (IBU) e.V. 2012 Requirements on the EPD for Automatic Doors, Automatic Gates, and Revolving Door Systems

List of Abbreviations

For the purposes of this document, the following abbreviations are per ANSI/BHMA A156.1-115, ISO 14040:2006, ISO 14044, 14025: 2006, ISO 21930 and EN 15804:

ADPE – Abiotic Depletion Potential for Non-Fossil Resources
ADPF – Abiotic Depletion Potential for Fossil Resources
ANSI – American National Standards Institute
AP – Acidification Potential of Soil and Water
ASTM – American Society for Testing and Materials
BH – Builders Hardware
BHMA – Builders Hardware Manufacturers Association
CAA – Clean Air Act (U.S)
CDM – Clean Development Mechanism
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CFR – Code of Federal Regulations
CPS – Construction Process Stage
CRU – Components for Reuse
DIS – Draft International Standard
EEE – Exported Electrical Energy
EET – Exported Thermal Energy
EN – European Standard
EP – Eutrophication Potential
EPA – Environmental Protection Agency
EPCRA – Emergency Planning and Community Right-to-Know Act
EPD – Environmental Product Declaration
FW – Net Consumption of Water
GWP – Global Warming Potential
HVAC – Heating, Ventilation, and Air Conditioning
IBTS – Integrated Building Technical System
HWD – Hazardous Waste Disposed
IBU – Institute Construction and Environment
ISO – International Organization for Standardization
LCA – Product Life Cycle Assessment
LCI – Life Cycle Inventory
LCIA – Life Cycle Impact Assessment
LEED – Leadership in Energy and Environmental Design

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LHV – Lower Heating Value (net caloric value)
MET – Materials for Energy Recovery
MFR – Materials for Recycling
MSDS – Material Safety Data Sheet
NHWD – Non-Hazardous Waste Disposed
NRSF – Use of Non-Renewable Secondary Fuel
ODP – Depletion Potential of the Stratospheric Ozone Layer
PCR – Product Category Rule
PENRE – Non-Renewable Primary Energy and Energy Carrier
PENRM – Non-Renewable Primary Energy as Material Utilization
PERE – Renewable Primary Energy as Energy Carrier
PERM – Renewable Primary Energy as Material Utilization
PERT – Total Use of Renewable Primary Energy Resources
PM – Particulate Matter
POCP – Formation Potential of Tropospheric Ozone
RSF – Use of Renewable Secondary Fuel
RSL – Reference Service Life
RWD – Radioactive Waste Disposed
SM – Use of Secondary Material
VER – Verified Emission Reduction

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Figure 1: Types of EPD with respect to Life Cycle Stages and Modules for building products

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Acknowledgements

This draft **PCR** has been prepared with input from the following organizations:

- BHMA
- Allegion
- ASSA ABLOY
- Stanley Security Systems

The following members comprised the **PCR** Peer Review Panel:

- Aaron Smith, ASSA ABLOY
- Don Baker, Allegion
- Dr. Lindita Bushi, ATHENA Sustainable Materials Institute (Chair)

1.0 Introduction to the PRODUCT CATEGORY RULES (PCR)

1.1 Purpose of the PCR

The intended application of this **PRODUCT CATEGORY RULE (PCR)** document is to provide a common set of specific rules, requirements and guidelines for developing ISO 14025 conformance Type III Environmental Product Declarations (EPDs) for **BUILDERS HARDWARE** products produced for use in North America and to specify the underlying requirements of the **LCA** in conformance with ISO 14040 series of **LCA** standards.

The primary users of this **PCR** will be the BHMA and its member companies. Other North American or global manufacturers could use this **PCR** as well.

This **PCR** document does not address either the economic or social aspects of **BUILDERS HARDWARE** products.

1.2 Scope of the PCR

This **PCR** is valid for **BUILDERS HARDWARE** products produced for use in North America as defined in ANSI/BHMA A156 series of standards that fulfill all standards, regulations, and technical specifications (SRTSs) shown under "List of References".

The Scope of this **PCR** includes all products covered in ANSI/BHMA A156 series of standards except for A156.10, A156.18, A156.27, A156.28, A156.32, A156.115, and A156.115-W. The scope of products covered under this **PCR** has been matched with that covered under the IBU **PCR** for Locks and Fittings with the exception of window fittings.

This **PCR** is applicable to the following 26 sub-categories of the **BUILDERS HARDWARE** product category:

- 1) Butts & Hinges,
- 2) Bored and Preassembled Locks and Latches,
- 3) Exit Devices,
- 4) Door Controls – Closers,
- 5) Cylinders and Input devices for locks,

-
- 6) Architectural Door Trim,
 - 7) Door Controls - Overhead Stops and Holders,
 - 8) Cabinet Hardware,
 - 9) Cabinet Locks,
 - 10) Interconnected Locks & Latches,
 - 11) Mortise Locks & Latches,
 - 12) Sliding and Folding Door Hardware,
 - 13) Release Devices: Closer Holder, Electromagnetic and Electromechanical
 - 14) Auxiliary Hardware,
 - 15) Self-Closing Hinges & Pivots,
 - 16) Strap and Tee Hinges and Hasps,
 - 17) Thresholds,
 - 18) Door Gasketing and Edge Seal Systems
 - 19) Electromagnetic Locks,
 - 20) Delayed Egress Locking Systems,
 - 21) Electrified Locking Devices,
 - 22) Continuous Hinges,
 - 23) Exit Locks, Exit Locks with Exit Alarms, Exit Alarms, Alarms for Exit Devices
 - 24) High Security Cylinders,
 - 25) Electric Strikes and Frame Mounted Actuators, and
 - 26) Auxiliary Locks

For additional clarification on the scope of this **PCR** see References for corresponding ANSI/BHMA standards for each product listed above.

1.3 Period of Validity of the PCR

This **PCR** is valid for a period of 5 (five) years from the date of the publication. This **PCR** may be revised sooner by the primary users identified in Section 1.1.

1.4 Content of the PCR

This **PCR** specifies the rules for the **BUILDERS HARDWARE PRODUCT CATEGORY** as regards to:

- the calculation criteria for the **LIFE CYCLE ASSESSMENT (LCA)**,
- the rules for the creation of a Background Report on the **LCA**, and
- the rules for the creation of the Environmental Product Declaration (EPD).

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1.5 Harmonization

In developing this PCR, UL Environment took every effort to harmonize the PCR development work with existing PCRs for **BUILDERS HARDWARE**. The PCR development process, for instance, began with a search for existing valid PCRs on this particular building product category. The following two PCR documents from the German Institute for Construction and Environment (IBU) were valid and considered in the development of this PCR:

- Product Category Rules for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU): *Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, Sep 2011*
- PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), *Part B: Requirements on the EPD for locks and fittings, July 2013.*

The IBU PCR for locks and fittings was modified for North American circumstances for the following reasons:

- the IBU PCR strictly follows the EN 15804:2012 standard, developed by regulatory and policy organizations in the European Union and developed by European experts rightly reflecting the interests, practices, and supply chain aspects in the EU. The PCR development team recognized the need for developing a separate PCR, compliant with ISO 14025 and ISO 21930, for **BUILDERS HARDWARE** manufactured for use in North America;
- the IBU PCR requires applying European category-impact-characterization factors. Instead, the USA Environmental Protection Agency's Tools for the Reduction and Assessment of Chemical and other environmental Impacts (TRACI) system of characterization factors shall be applied for North American **BUILDERS HARDWARE LCA** reports and EPDs;
- the IBU PCR requires applying European based background LCI data sources. Instead, data sources representative of North American circumstance and conditions (e.g., US LCI database, US EI database, etc.) shall be used for North American **BUILDERS HARDWARE LCA** reports and EPDs;
- the IBU PCR is based on European technical requirements and reference standards which are different from North American standards. As specified in Section 2, North American reference standards and technical requirements shall be used to describe the North American **BUILDERS HARDWARE** products;

- the IBU PCR documents follow a specific structure. It consists of a generic IBU PCR Part A document applicable for all building & construction products and a product specific IBU PCR Part B. This North American PCR adopts a different structure and is a standalone document;
- the IBU PCR follows European regulations for hazardous and toxic materials and substances. North American regulations are different from European. This North American **BUILDERS HARDWARE PCR** specifies hazardous and toxic materials and substances in accordance with regulations applicable in the North American countries for which the PCR is to be valid;

Despite the above variations, the PCR team adopted almost all LCA technical aspects of the IBU PCR, for instance -

- definition of **DECLARED UNIT**,
- the modular approach,
- **PRODUCT SYSTEM** boundary,
- life cycle stages definition and processes,
- environmental parameters derived from LCA including parameters describing environmental impacts, parameters describing resource use, and parameters describing different **WASTE** categories and output flows,
- additional technical information for the optional “construction, use and end-of-life” life cycle stages,
- additional environmental information during the use stage which is not covered by the **LCIA**,
- allocation rules,
- the EPD content template, etc. -

in order to develop this North American **BUILDERS HARDWARE PCR** and maintain a comparable level of harmonization.

2.0 Rules for Completing the LCA and Background Report

A **LIFE CYCLE ASSESSMENT (LCA)**, **LIFE CYCLE INVENTORY (LCI)** and/or **INFORMATION MODULES**, complying with ISO 14040/14044, describing the **BUILDERS HARDWARE** product and based on transparent and credible data, must be presented in the Background Report to support the EPD. Additionally, model assumptions with a significant influence on the declared results must be clearly stated in the Background Report and the EPD.

The LCA Background Report shall be made available to the verifier with the requirements on confidentiality stated in ISO 14025. The Background Report is not part of the public communication.

The life-cycle stages which are taken into account in the Assessment must be thoroughly presented in relation to the considered processes. The Product Stage must always be thoroughly presented. Construction Process, Use, and End-of Life Stages are defined as optional. If included, assumptions and key parameters considered in these optional stages must be clearly stated.

COMPARATIVE ASSERTIONS with other products are inadmissible. The Background Report and EPD structures shall comply with the structure specified in Section 2.2 of this document.

2.1 Rules for Completing the LIFE CYCLE ASSESSMENT

2.1.1 Product Category Definition

BUILDERS HARDWARE PRODUCT CATEGORY is a collection of products that are used to secure, control access, control motion, protect openings from damage, provide safe passage to users, seal, and provide functional or non-functional decorative elements allowing code-compliant solutions for swing- and sliding-door openings in buildings. A sub-category of **BUILDERS HARDWARE** also addresses the needs of cabinet hardware.

This PCR covers the **BUILDERS HARDWARE PRODUCT CATEGORY** which for the purposes of this PCR consists of 26 sub-categories shown in Table 1, which also shows the ANSI/BHMA standards that provide detailed descriptions and specifications for each **BUILDERS HARDWARE** product sub-category.

2.1.2 DECLARED UNIT/ FUNCTIONAL UNIT

The **DECLARED UNIT** is defined as one unit of product. See Table 1 for a complete listing of the sub-categories and their respective **DECLARED UNITS**. The name of the product subcategory for which the LCA is conducted must be clearly stated, as given in Section 1.2 and Table 1.

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A Unit is defined as the set of the fewest **BUILDERS HARDWARE** elements, together with the fasteners required to affix the product to the building, which comprise one complete **BUILDERS HARDWARE** product. More than one unit may be required in use to perform the required function(s), but less than one unit cannot perform the required function(s). All elements must be transparently reported and described in the **LCA** report.

The ISO Standards Definition of **FUNCTIONAL UNIT** is given above. The **FUNCTIONAL UNIT** of a **BUILDERS HARDWARE** product must be defined on a case-by-case basis. For example, where the product is a door hinge the function may be defined as “securing a North American standard 3’x7’ door, installed in a North American standard building with an **ESTIMATED SERVICE LIFE (ESL)** of 60 years, with selected **BUILDERS HARDWARE** hinges having a **REFERENCE SERVICE LIFE** of 20 years.

The **REFERENCE UNIT** is the total number of **DECLARED UNITS** required to deliver the **FUNCTIONAL UNIT**. For the example given, the **REFERENCE UNIT** is nine units of the selected hinge.

Typical installed usage of the products listed in Table 1 is for a standard 3’x7’ single-leaf door, or, where the product is a sliding or folding door, a standard 6’8”-wide opening.

The manufacturer of the **BUILDERS HARDWARE** product must complete Table 2. The **DECLARED UNIT** and the mass reference in kg must be indicated as shown in Table 2.

Table 1
BUILDERS HARDWARE Product Sub-categories and DECLARED UNITS

BUILDERS HARDWARE product sub-category	Reference standard	DECLARED UNIT	<u>Comments supporting definition of REFERENCE UNIT for a standard 3'x7' single-leaf door application</u>
Butts & Hinges	ANSI/BHMA A156.1-2013	1 Unit	Typical usage is 3 units per standard door leaf.
Bored and Preassembled Locks and Latches	ANSI/BHMA A156.2-2011	1 Unit	Typical usage is one unit per standard door leaf.
Exit Devices	ANSI/BHMA A156.3-2008	1 Unit	Typical usage is one unit per standard door leaf. This sub-category does contain some products besides exit devices that could be used in addition to exit devices so that there could be more than one unit per door leaf or opening. These other products would still be declared on a Units basis. <i>Specify length per unit and per door opening, in meters.</i>
Door Controls - Closers	ANSI/BHMA A156.4-2008	1 Unit	Typical usage is one unit per standard door leaf.
Cylinders and Input Devices for Locks	ANSI/BHMA A156.5-2010	1 Unit	Typical usage is one unit per standard door leaf.
Architectural Door Trim	ANSI/BHMA A156.6-2010	1 Unit	One or more units per standard door leaf. <i>Specify length per unit and per door opening, in meters.</i>
Door Controls - Overhead Stops and Holders	ANSI/BHMA A156.8-2010	1 Unit	Typical usage is one unit per standard door leaf.

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BUILDERS HARDWARE product sub-category	Reference standard	DECLARED UNIT	<u>Comments supporting definition of REFERENCE UNIT for a standard 3'x7' single-leaf door application</u>
Cabinet Hardware ¹⁾	ANSI/BHMA A156.9-2010	1 Unit	Specify the number of units per cabinet door or per cabinet shelf, or per other cabinet element.
Cabinet Locks ¹⁾	ANSI/BHMA A156.11-2010	1 Unit	Specify the number of units per cabinet door or per other cabinet lockable element.
Interconnected Locks & Latches	ANSI/BHMA A156.12-2013	1 Unit	Typical usage is one unit per standard door leaf.
Mortise Locks & Latches	ANSI/BHMA A156.13-2012	1 Unit	Typical usage is one unit per standard door leaf.
Sliding and Folding Door Hardware ²⁾	ANSI/BHMA A156.14-2013	1 Unit	Typical usage is one unit per standard 6'8" door opening.
Release Devices: Closer Holder, Electromagnetic and Electromechanical	ANSI/BHMA A156.15-2011	1 Unit	Typical usage is one unit per standard door leaf.
Auxiliary Hardware ¹⁾	ANSI/BHMA A156.16-2008	1 Unit	Products in this sub-category are sold per unit. More than one unit may be used per standard door leaf, standard door opening, or cabinet element. Some components are used in applications not associated with door openings or cabinets. These external applications are not covered by this PCR.
Self-Closing Hinges & Pivots	ANSI/BHMA A156.17-2010	1 Unit	Typical usage is 3 units per standard door leaf.

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BUILDERS HARDWARE product sub-category	Reference standard	DECLARED UNIT	<u>Comments supporting definition of REFERENCE UNIT for a standard 3'x7' single-leaf door application</u>
Strap and Tee Hinges and Hasps	ANSI/BHMA A156.20-2012	1 Unit	Typical usage is 3 units per standard door leaf.
Thresholds	ANSI/BHMA A156.21-2009	1 Unit	Specify length in meters.
Door Gasketing and Edge Seal Systems	ANSI/BHMA A156.22-2012	1 Unit	Specify length in meters.
Electromagnetic Locks	ANSI/BHMA A156.23-2010	1 Unit	Typical usage is one unit per standard door leaf.
Delayed Egress Locking Systems	ANSI/BHMA A156.24-2012	1 Unit	Typical usage is one unit per standard door leaf.
Electrified Locking Devices	ANSI/BHMA A156.25-2007	1 Unit	Products complying to this standard typically must comply with other standards too. Typical usage is one unit per standard door leaf.
Continuous Hinges	ANSI/BHMA A156.26-2012	1 Unit	One unit is used per door leaf. <i>Specify length in meters</i>
Exit Locks, Exit Locks with Exit Alarms, Exit Alarms, Alarms for Exit Devices	ANSI/BHMA A156.29-2012	1 Unit	Typical usage is one unit per standard door leaf.
High Security Cylinders	ANSI/BHMA A156.30-2007	1 Unit	Typical usage is one unit per standard door leaf.
Electric Strikes and Frame Mounted Actuators	ANSI/BHMA A156.31-2007	1 Unit	Typical usage is one unit per standard door leaf.
Auxiliary Locks	ANSI/BHMA A156.36-2010	1 Unit	Typical usage is one unit per standard door leaf.

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Note 1: For the Cabinet Hardware, Cabinet Locks, and Auxiliary (Cabinet) Hardware **BUILDERS HARDWARE** sub-categories, column four, provides comments to support the definition of the specific **REFERENCE UNIT**, and is not related to a 3'x7' door leaf or a 6'8" door opening.

Note 2: For the Sliding and Folding Door Hardware sub-category, column four, provides comments to support the definition of the **REFERENCE UNIT** for a 6'8" door opening.

Table 2
DECLARED UNIT

Name	Value	Unit
Name of DECLARED UNIT	One	Unit ⁽¹⁾ (see Table 1)
Weight per DECLARED UNIT , excluding fasteners		Kg
Fasteners (pieces x weight/piece)		Kg ⁽²⁾
DECLARED UNIT		kg

Note 1: Specify length per unit, if applicable (see Table 1, column 4);

Note 2: Do not duplicate Fasteners in (optional) Module A5 (Installation)

As required in ISO 21930, Clause 6.2.3, information provided using a **DECLARED UNIT** shall not be used for purposes of comparing **BUILDERS HARDWARE** EPDs. To make such comparisons between EPDs, a **FUNCTIONAL UNIT** must be defined and a “cradle to grave” **LCA** of **BUILDERS HARDWARE** products must be conducted.

A **DECLARED UNIT** is used instead of a **FUNCTIONAL UNIT** when the precise function of the product or scenario(s) at the building level is not stated or is unknown [EN 15804] throughout the cradle-to-grave life cycle. A **DECLARED UNIT** provides a reference by means of which the material flows of the **INFORMATION MODULES** of a **BUILDERS HARDWARE** product are normalized (in a mathematical sense) to produce data, expressed on a common basis [ISO 21930, EN 15804], to one unit.

Based on ISO 14044, a **PRODUCT SYSTEM** may fulfil a number of possible functions and the one(s) selected for a **LCA** study depend(s) on the goal and scope of the **LCA**.

For a particular **LCA**, not all functions may be relevant and the relevant ones must be identified. The **FUNCTIONAL UNIT** quantifies the performance characteristics of the identified functions of the **BUILDERS HARDWARE** product(s), for use as a **REFERENCE UNIT** in an EPD.

If the **FUNCTIONAL UNIT** covers only one function, and additional functions are not taken into account then these omissions shall be explained and documented.

For purposes of defining the **FUNCTIONAL UNIT** and the **REFERENCE UNIT**, an average **ESTIMATED SERVICE LIFE (ESL)** of a building in North America of 60 years shall be applied.

2.1.3 Product Description

The product to be assessed shall be described in reference to its technical and functional properties and its application ranges.

The manufacturer should specify the number of units of the **BUILDERS HARDWARE** product for the most typical applications: For example, for a selected “Butts & Hinges” product, the manufacturer should specify: 3 units of “Butts & Hinges” are typically used in a N.A standard 3’x7’ door leaf application. Architect shall specify units used in non-standard applications.

The **LCA** can be conducted for either an average or a specific product (e.g. a representative product with the greatest environmental impact). In the case where an **LCA** is calculated as average environmental performance for product a statement to that effect shall be included in the Background Report together with a description of the range and variability of the **LIFE CYCLE IMPACT ASSESSMENT (LCIA)** results. For products produced in multiple locations, the locations of the factories/plants shall be reported in the Background Report.

The Product Description must clearly state if the product is:

- A specific product from a specific factory/plant of a manufacturer,
- A specific product as an average from several of the manufacturer’s plants,
- An average product from a manufacturer’s specific plant,
- An average product as an average from several of the manufacturer’s plants,
- A specific product as an average from the plants of more than one manufacturer,
- An average product as an average from the plants of more than one manufacturer.

The EPD shall provide a narrative description of the **BUILDERS HARDWARE** product in a manner that enables the user to clearly identify the product. As defined in Section 3.2, this description will include:

- Product description
- Designated application of the product
- Product data
- Technical data
- Placing on the market / Application rules
- Product formulation
- Manufacturing
- Environment and health during manufacturing
- Packaging
- Product installation
- Environment and health during use stage
- **REFERENCE SERVICE LIFE**
- End-of-Life
- Further information (optional)

2.1.4 Product's REFERENCE SERVICE LIFE (RSL)

The **REFERENCE SERVICE LIFE** of a **BUILDERS HARDWARE** product depends on the type of product or product sub-category, its application, the user, and required maintenance of the product.

The **RSL** shall only be specified by the manufacturer for “Cradle-to-building with Use Stage (Option 3)” and “Cradle-to-grave” type of EPDs (see Table 3).

In these two cases, manufacturer shall specify:

- (1) The ANSI grade of the product (e.g. ANSI Grade 1, 2 or 3) based on the ANSI verified cycle count testing and the number of the cycles per grade; e.g. ANSI Grade 1; 1,000,000 cycles.
- (2) The expected/default number of cycles/per year for the selected **BUILDERS HARDWARE** product application, e.g., 50,000 cycles/year, which defines the reference set of in-use conditions for the RSL.

Then, the **RSL** (in years) shall be calculated by dividing the total number of cycles (1) by the default number of cycles/year (2) for the selected **BUILDERS HARDWARE** product application, e.g. $\text{RSL} = 1,000,000 \text{ cycles} / 50,000 \text{ cycles/year} = 20 \text{ years}$.

All assumptions in regard to the **RSL** calculations shall be documented and justified.

If the **RSL** of the product exceeds the building **ESL** of 60 years, then the replacement factor is considered to be 1.

The manufacturer might also choose to declare the ANSI grade of the **BUILDERS HARDWARE** product for other types of EPDs.

For an average product with different **RSLs** (see 2.1.3), a weighted-average **RSL** shall be estimated based on the annual production.

2.1.5 System Boundary

LCA is conducted by means of models describing the environmental impacts of elements of the **PRODUCT SYSTEMS** throughout the life cycle of the product to be assessed, from raw material supply and manufacturing through use and disposal. The System Boundary for the product is broken into the Stages of Manufacturing, which includes extraction and processing of resources; Construction Process; Use, which includes periodic maintenance and replacement and effects on the building's energy performance; and End of Life, which includes separation from the building and final disposition of the product (see Figure 1).

The System Boundary determines which **UNIT PROCESSES** are included in the **LCA** of a **PRODUCT SYSTEM**, and which are not. **PRODUCT SYSTEMS** are sets of **UNIT PROCESSES** and intermediate flows within the System Boundary, together with energy and material (or product) flows into and out of the System Boundary. This section specifies the boundary of the **PRODUCT SYSTEM** for which **LCA** is to be reported and, in particular, the boundary that interfaces with other **PRODUCT SYSTEMS** in the life of a building. It also specifies the processes that are to be included in each of the life cycle stages as listed below.

The **LCA** is organized into Modules that allow easier preparation of data throughout the life cycle of the product. This approach requires that the system boundary for the life cycle stages and the **INFORMATION MODULES** included be transparent, well defined, and applicable to any **BUILDERS HARDWARE** product.

For the purposes of creating EPDs from this PCR, the following life cycle Stages and **INFORMATION MODULES** are considered:

- A1 through A3 Product Stage
- A4 through A5 Construction Process Stage
- B1 through B7 Use Stage
- C1 through C4 End-of Life Stage

Only the declaration of the Product Stage modules, A1 to A3, is required for compliance with this PCR.

If Use Stage reporting is chosen, (see Table 3), **INFORMATION MODULES** B1-B5 shall be reported for all products.

Additionally, Operational Energy Use Stage **INFORMATION MODULE** B6 shall be reported for all product that contain battery and/or electrical components (i.e. that consume energy during the Use Stages).

Table 3
BUILDERS HARDWARE product EPD types

EPD type	DECLARED UNIT (DU) or FUNCTIONAL UNIT (FU)	Life Cycle Stages and modules	RSL	Primary audience
Cradle to shipping gate	DU	Product stage; modules A1 to A3	Not specified	Business-to-business (B to B)
Cradle to building- (Option 1)	DU	Product and construction stages; modules A1 to A5	Not specified	Business-to-business (B to B)
Cradle to building- with EOL stage (Option 2)	DU	Product, construction and EOL stages; modules A1 to A5 and C1 to C4	Not specified	Business-to-business (B to B)
Cradle to building- with use stage (Option 3)	FU	Product, construction and use stages; modules A1 to A5 and B1 to B6	RSL is required	Business-to-business (B to B)
Cradle to grave	FU	Product, construction, use and EOL stages; modules A1 to C4	RSL is required	Business to business (B to B) and/or Business to consumer (B to C)

Note: INFORMATION MODULE D may be included in the option 1, 2, 3, and cradle-to-grave EPDs

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Figure 1: Types of EPD with respect to Life Cycle Stages and Modules for building products¹

BUILDING ASSESSMENT INFORMATION																
BUILDING LIFE CYCLE INFORMATION														SUPPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE		
A 1 – 3			A 4 – 5		B 1 - 7					C 1 – 4				D		
PRODUCT stage			CONSTRUCTION PROCESS stage		USE stage					END OF LIFE stage				Benefits and loads beyond the system boundary		
A1	A2	A3	A4	A5	B1		B2	B3	B4	B5	C1	C2	C3	C4	Reuse- Recovery- Recycling- potential	
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use		Maintenance	Repair	Replacement	Refurbishment	De-construction demolition	Transport	WASTE processing	Disposal		
scenario		scenario		B6		Operational energy use					scenario		scenario			
scenario		scenario		B7		Operational water use					scenario		scenario			
EPD	Cradle to gate DECLARED UNIT	Mandatory													No RSL	
	Cradle to gate with option DECLARED UNIT/FUNCTIONAL UNIT	Mandatory	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	Inclusion Optional (1) 2)	RSL 2)	Inclusion optional
	Cradle to grave FUNCTIONAL UNIT	Mandatory	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	Mandatory (1) 2)	RSL 2)
1) Inclusion for a declared scenario 2) If all scenarios are given																

¹ EN15804: 2012 - Sustainability of construction works – Environmental Product Declarations – core rules for the product category of construction products.

The setting of the system boundary follows two principles:

- The “modularity principle”: Where processes influence the product’s environmental performance during its life cycle, they shall be assigned to the module of the life cycle where they occur; all environmental aspects and impacts are declared in the life cycle stage where they occur;
- The “polluter pays principle”: Processes of **WASTE** processing shall be assigned to the **PRODUCT SYSTEM** that generates the **WASTE** until the “end-of-**WASTE**”² state is reached.

The omission(s) of significant environmental aspects or life-cycle stages shall be justified and documented.

2.1.5.1 Product Stage (includes Modules A1 through A3)

Product Stage includes the provision of all materials, products, and energy and includes **WASTE** processing or disposal of final residues during the product stage. However, production of capital goods, infrastructure, production of manufacturing equipment and personnel-related activities are not included. HVAC (heating, ventilation, and air conditioning), artificial lighting and transport within the Manufacturing site will only be considered if they do not meet the cut-off criteria (see Section 2.1.6).

The Product Stage will account for:

- A1 Extraction and processing of raw materials (e.g. mining and refining processes) and biomass production and processing (e.g. agricultural or forestry operations);
- A1 Reuse of products or materials from a previous **PRODUCT SYSTEM** (i.e. recycled steel);
- A1 Processing of **SECONDARY MATERIALS** used as input for manufacturing the product, but not including those processes that are part of the **WASTE** processing in the previous **PRODUCT SYSTEM**; A1 Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- A1 Energy recovery and other recovery processes from **SECONDARY FUELS**, but not including those processes that are part of **WASTE** processing in the previous **PRODUCT SYSTEM**;
- A2 Transportation up to the factory gate and internal transport;

² See EN 15804:2012 Annex B.1 End-of-waste for decision tree on determining end-of-waste state.

-
- A3 Production of **ANCILLARY** materials or pre-products (i.e. lubricants);
 - A3 Manufacturing of products and **CO-PRODUCTS**;
 - A3 Manufacturing of packaging;
 - A1-A3 **WASTE** processing or disposal, including any packaging **WASTE**.

For the Product Stage the boundary is set from raw materials acquisition through to production and the delivery of the finished product ready for dispatch (factory gate). The assessment scope including all processes both considered and neglected shall be described appropriately, and is preferably presented as a flow diagram.

In the case of input of **SECONDARY MATERIALS**, or energy recovered from **SECONDARY FUELS**, the System Boundary between the system under study and the previous system (that is, the source of the **SECONDARY MATERIALS**) is set where outputs of the previous system reach the end-of-**WASTE** stage. In the case of outputs, flows leaving the system at the end-of-**WASTE** boundary of the Product Stage (A1-A3) shall be allocated as they are allocated to **CO-PRODUCTS**.

The flows reaching the system at the A1-A3 boundary are determined as follows, and loads and benefits from allocated **CO-PRODUCTS** shall not be declared in Module D:

- Production **WASTE** whose materials are recycled without any modification of the features inherent to the materials (i.e. closed-loop or open-loop) can be considered as recycled within Modules A1-A3 to the maximum volume used in production. A **CO-PRODUCT** allocation is necessary for production **WASTE** exceeding the volumes used in Modules A1-A3.
- **CO-PRODUCT** allocation is necessary for production **WASTE** whose materials are reused anywhere other than in the **PRODUCT SYSTEM** (open-loop).
- Heat and power from energy recovery of production **WASTE** in Modules A1-A3 can be considered closed-loop within Module A1-A3 if they are used within Modules A1-A3 and only to the maximum amount in MJ as is required. A **CO-PRODUCT** allocation is necessary for energy surpluses exceeding the volumes considered closed-loop.

If an allocation procedure different from **CO-PRODUCT** allocation is chosen for flows that reach the system at the boundary A1-A3, this procedure shall be in conformance with ISO 14044:2006 and has to be justified³. The resulting material and energy flows are to be

³ This PCR and the IBU PCR Part B Requirements on the EPD for locks and fittings, July 2013 comply with EN 15804, Clause 6.4.3 Allocation of input flows and output emissions. As stated in EN 15084, Clause 6.4.3.1, "In this standard, the rules for allocation are based on

described transparently in the background report with regard to the amounts of materials and energy within Module A1-A3.

Allocation associated with transport should be based on weight or volume, as appropriate for realistic modeling.

2.1.5.2 Construction Process Stage (includes modules A4 and A5)

Modules A4 and A5 are optional and the construction stage will report:

- A4: Transport to the building site
- A5: Installation into the building

Construction Process Stage (CPS) includes provision of all materials, products and energy, and **WASTE** processing or disposal of final residues during the CPS. Also included are all impacts related to any losses of product during this CPS (i.e., the production, transport, and **WASTE** processing or disposal of the lost products and materials).

The CPS includes **INFORMATION MODULES** for:

- A4 Transportation from the manufacturing gate to the construction site
- A4-A5 Storage of products, including the provision of heating, cooling, humidity control etc.
- A4-A5 The **WASTE** of product that occurs at the construction site when there is improper installation and the component or product is discarded
- A4-A5 **WASTE** processing from product packaging and wastage of product during the CPS, up to the end-of-**WASTE** state or disposal of final residues
- A5 Installation of the product in the building including manufacture and transportation of **ANCILLARY** materials and any energy or water required for installation or operation of the construction site.
- A5 For all **BUILDERS HARDWARE** product that contain battery(ies) and/or electrical component(s) (i.e. that consume energy during the use stage), manufacture and transportation of battery(ies) and/or **ANCILLARY** electrical products (i.e. wire) shall be included. Fasteners are included under **DECLARED UNIT** and must not be duplicated

the guidance given in EN ISO 14044:2006, 4.3.4. However, the basic procedures and assumptions used in EN ISO 14044 have been refined in order to reflect the goal and scope of this standard and EN 15643-2".

here. This module also includes on-site operations relating to the installation of the product.

2.1.5.3 Use Stage

The Use Stage includes the use of construction products, equipment, and services in their proper function. It also includes maintenance (including cleaning), repair, replacement, and refurbishment.

Use Stage also includes their use for protecting, conserving, moderating, or controlling a building, e.g. modules describing the building operation through building-related services such as heating, cooling, lighting, water supply and internal transport (provided, e.g., by elevators and escalators), but none of these latter usages are expected to apply to **BUILDERS HARDWARE** products covered by this **PCR**.

It may be difficult to separate all Use-Stage processes and the connected aspects and impacts into the optional individual Modules B1-B5 and B6-B7 listed below. Any deviation from the listed categorization of aspects and impacts into modules B1-B5 and B6-B7 shall be transparently reported and justified.

2.1.5.3.1 Use Stage Related to the Building Structure (modules B1 through B5)

When incorporating use stage of the product in the building structure, **INFORMATION MODULES** B1 through B5 shall be included.

- B1: Use of the installed product
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment

The **RSL** of a **BUILDERS HARDWARE** product depends on the type of product or product sub-category, its application, the user, and required maintenance of the product. For this purpose, the Use Stage impacts shall be reported in accordance with the **RSL** of the product as per Section 2.1.4.

2.1.5.3.1.1 Use of the Installed Product (Module B1)

The Product's **RSL** as defined in Section 2.1.4 shall be used.

This "Use of the installed product", Module B1, covers environmental impacts and aspects that are not covered by Modules B2-B7 and that arise from the product installed in the building during its normal (i.e. anticipated) use.

It is expected that **BUILDERS HARDWARE** products will have no impact in terms of any emissions to environment according to this Module B1; electricity use in operation is covered in Module B6.

2.1.5.3.1.2 Maintenance (Module B2)

The "Maintenance" Module covers the combination of all prescribed technical and associated administrative activities required in order to maintain the product installed in a building, construction works, or components in such a way that its requisite functional and technical performance as well as the aesthetic qualities are retained. This includes preventive and regular maintenance activities such as cleaning, prescribed technical service,. Water and energy usage required for cleaning as part of maintenance measures, for example, must be considered in this Module. For all **BUILDERS HARDWARE** products that contain battery(ies), the number of battery(ies) replaced per **RSL** shall be claimed in this Module.

The "Maintenance" boundary shall include in addition:

- The production and transportation of any component or **ANCILLARY** product used for maintenance, including cleaning
- Transportation of any **WASTE** from maintenance processes or from maintenance related transportation
- The end-of-life processes of any **WASTE** from transportation and the maintenance process, including any part of the component and **ANCILLARY** materials removed

Required or expected maintenance are to be modeled according to manufacturer's guidelines. Assumptions and key parameters must be clearly stated and the manufacturer is to submit supporting documentation to justify the assumptions made.

2.1.5.3.1.3 Repair (Module B3)

The module “repair” covers a combination of all technical and associated administrative actions during the service life associated with corrective, responsive, or reactive treatment of a **BUILDERS HARDWARE** product or its parts installed in the building or construction works to return it to an acceptable condition in which it can perform its required functional and technical performance. It also covers the preservation of the aesthetic qualities of the product. Replacement of a broken component or part due to damage should be assigned to “repair”, whereas replacement of a whole element due to damage should be assigned to the module “replacement” [EN 15804].

The boundary for “Repair” must include:

- Repair processes of the repaired part of a component including:
 - the production of the repaired part of a component and of **ANCILLARY** materials
 - use of related energy and water
 - the production and transport aspects and impacts of any wastage of materials during the repair process
- The transportation of the repaired part of component and **ANCILLARY** materials, including aspects and impacts of any wastage of materials during repair-related transportation
- The-end-of-life processes of any **WASTE** from transportation and the repair process, including the part of the component and **ANCILLARY** materials removed

2.1.5.3.1.4 Replacement (Module B4)

The module “Replacement” covers the combination of all technical and associated administrative actions during the service life associated with the return of a **BUILDERS HARDWARE** product to a condition in which it can perform its required functional or technical performance, by replacement of a whole **BUILDERS HARDWARE** product that has reached the end of its **RSL**. Replacement of a broken component or part due to damage should be included as “Repair”, but replacement of a whole **BUILDERS HARDWARE** product due to damage should also be considered as “Replacement”. Replacement of a whole **BUILDERS HARDWARE** product as part of a concerted replacement program for the building should be considered as “Refurbishment” [EN 15804].

The boundary for “Replacement” must include:

- Production of the components and **ANCILLARY** materials used for replacement
- Replacement process, including related water and energy use and the production aspects and impacts of any **WASTE** of materials used during the replacement processes
- Transportation of the components and **ANCILLARY** materials used for replacement, including the aspects and impacts of any **WASTE** of materials during transportation
- End-of-life processes of any **WASTE** from transportation and the replacement processes, including the components and **ANCILLARY** materials removed

The number of replacements of product expected during the **ESL** of the building of 60 years shall be declared. Required or expected maintenance are to be modeled according to manufacturer’s guidelines. Assumptions and key parameters must be clearly stated and the manufacturer is to submit supporting documentation to justify the assumptions made.

Since the **REFERENCE SERVICE LIFE (RSL)** of a building product is less than the **ESTIMATED SERVICE LIFE (ESL)** of a building in North America, the number of replacements that will be necessary to fulfill the required performance and functionality over the building **ESL** shall be identified. The combined impacts of the original product and any replacements shall be determined by dividing the building **ESTIMATED SERVICE LIFE (ESL)** (60 yrs) by the **RSL** of the product (for example 20 years for Grade 1), and the impacts multiplied by the factor, which is in this case, three.

Replacements should be rounded-up to the highest integer instead of a fraction over the course of the **ESL** of the building e.g, 2.6 rounded to 3. That is, if the **RSL** is greater than remaining life of the building, the aspects and impact of a whole **RSL** must be used, not a fractional **RSL** corresponding to the remaining expected building life.

If applicable, for a fractional remainder of a replacement cycle, the total impacts of the product’s manufacturing, installation, deconstruction, etc. should be multiplied by the fraction of **RSL** that the expected life of the product comprises⁴.

⁴ Example: If a product lasts 25 years within a 60 year **ESL** of a building, then the full impacts should be counted for the first two life cycles. For the replacement, the full impacts of the third life cycle should be divided over the remaining life required to service the building. (10/25 or 40% of the total)

2.1.5.3.1.5 Refurbishment (Module B5)

The module “refurbishment” covers the combination of all technical and associated administrative actions during the service life of a product associated with the return of a building or other construction works or their parts to a condition in which it can perform its required functions. These activities cover a concerted program of maintenance, repair and/or replacement activity, across a significant part or whole section of the building.

Restoration activities should be included within refurbishment.

The boundary for “Refurbishment” must include:

- Production of the components and **ANCILLARY** materials used for “Refurbishment”
- Refurbishment processes and related water and energy use including production aspects and impacts of any **WASTE** of materials used during the refurbishment processes
- Transportation of the components and **ANCILLARY** materials used for refurbishment, including production aspects and impacts of any **WASTE** during transportation
- End-of-life processes of any wastage from transportation and the refurbishment processes, including the components and **ANCILLARY** materials removed

2.1.5.3.2 B6-B7 Use Stage

2.1.5.3.2.1 Energy use to operate **INTEGRATED BUILDING TECHNICAL SYSTEMS (IBTS)**(Module B6)

As defined in Section 1.2, the scope of this **PCR** covers selected **BUILDERS HARDWARE** products which are part of **IBTS**.

The boundary of the module “Energy use to operate **IBTS**” shall include energy use during the operation of the product , and its associated environmental aspects and impacts including processing and transportation of any **WASTE** arising on-site from the use of energy.

Aspects related to the production, transportation and installation of equipment required to supply energy to the building shall be assigned to Modules A1-A5. Energy use during maintenance, repair, replacement, or refurbishment activities for the equipment shall be assigned to Modules B2-B5. Aspects related to the **WASTE** processing and final disposal of equipment shall be assigned to Modules C1-C4 [EN 15804].

Operational Energy Use Stage B6 shall be reported for all products that contain battery and/or electrical components (i.e. that consume energy during the Use Stage).

2.1.5.3.2.2 Operational water use by building integrated technical systems (Module B7)

This Module is not anticipated to be a part of the **LCA** calculation for the Use Stage for any **BUILDERS HARDWARE** products within the scope of this **PCR**. For consistency with EN 15804 Module B7 is included as an optional reporting Module and shown in Fig. 1.

The module B7 shall include water use during the operation of the **IBTS**, together with its associated environmental aspects and impacts considering the life cycle of water including production and transportation and **WASTEWATER** treatment [EN 15804, Clause 6.3.4.4.3]. This **PCR** defines that **BUILDERS HARDWARE** products have no impact on the operational water use by **IBTS** during the 60 year **ESL** of a building in North America.

2.1.5.4 End-of-Life Stage (Modules C1 through C4)

The end-of-life stage of the **BUILDERS HARDWARE** product starts when it is removed, dismantled, or deconstructed from the building and does not provide any further function. It can also start at the end-of-life of the building, depending on the choice of the product's end-of-life scenario. The choice of the **WASTE** management methods shall be based on the state of the art and the **WASTE** management methods chosen shall be documented in the Background Report.

During the end-of-life stage of the product or of the building, all output from dismantling, deconstruction or demolition of the building; or of the maintenance, repair, replacement or refurbishing processes; all debris, construction products, materials or products etc. leaving the building, are at first considered as **WASTE**.

This output however reaches the end-of-**WASTE** state when it complies with all of the following conditions:

- The material or product reclaimed from the **WASTE** is commonly used for specific purposes.
- A market or demand, identified by a positive economic value, exists for such a reclaimed material or product.
- The reclaimed material or product fulfills the technical requirements for the specific purposes and meets applicable legislation and standards.

The reclaimed material or product shall not lead to overall adverse environmental or human health impacts in use.

When incorporating an End-of-Life scenario, modules C1 through C4 shall be included.

End-of-Life Stage includes:

- C1: Deconstruction, dismantling, or demolition of the product from the building, including initial on-site sorting of the materials
- C2: Transportation of the removed product as part of **WASTE** processing, e.g. to a recycling site, and transportation of **WASTE**, e.g., to final disposal
- C3: **WASTE** processing for reuse, recycling, energy recovery, and/or reclamation.⁵ **WASTE** processing shall be modeled and the elementary flows shall be included in the inventory.
- C4: **WASTE** disposal including physical pre-treatment and management of the disposal site including provision and transport of all materials, products, and energy and water used during the end-of-life stage.

Environmental loads (e.g., emissions) from **WASTE** disposal in Module C4 are considered part of the **PRODUCT SYSTEM** under review, according to the “polluter pays principle”. If however, this process generates energy such as heat and power from **WASTE** incineration or landfill gas, the potential benefits from utilization of such energy in the next **PRODUCT SYSTEM** are assigned to Module D and calculated using current average substitution methods.

2.1.5.5 Supplementary Information Beyond the Building Lifecycle (Module D)

INFORMATION MODULE D aims at transparency regarding the environmental benefits or loads resulting from reusable products, recyclable materials, and/or useful energy carriers leaving a **PRODUCT SYSTEM**, e.g., as **SECONDARY MATERIALS** or **SECONDARY FUELS**.

Any declared benefits and loads from net flows leaving the **PRODUCT SYSTEM** that have not been allocated as **CO-PRODUCTS** and that have passed the end-of-**WASTE** state shall be included in Module D. Avoided impacts from allocated **CO-PRODUCTS** shall not be allocated to

⁵ E.g., collection of waste fractions from demolition, and waste processing of material flows intended for reuse, reclamation, and energy recovery.

Module D. The information in Module D may contain technical information as well as the quantified predetermined parameters derived from the **LIFE CYCLE ASSESSMENT**.

2.1.5.6 Aggregation of **INFORMATION MODULES**

As per Section 7.5 of EN 15804, the indicators declared in the individual **INFORMATION MODULES** of a product life cycle A1 to A5, B1 to B7, C1 to C4 and module D as described in Figure 1 shall not be added up in any combination of the individual **INFORMATION MODULES** into a total or sub-total of the life cycle stages A, B, C or D. As an exception **INFORMATION MODULES** A1, A2, and A3 may be aggregated.

2.1.6 Cut-off Criteria

The following procedure shall be followed for the exclusion of inputs and outputs:

- All inputs and outputs to a **UNIT PROCESS** for which data are available shall be included in the calculation. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions concerning such value choices shall be documented.
- In cases of insufficient input data or data gaps for a **UNIT PROCESS**, the cut-off criteria shall be 1% of total primary energy usage and 1% of the total mass input of that **UNIT PROCESS**;
- The total of neglected input and output flows per each group module: A1-A3, A4-A5, B1-B5, B6-B7 and C1-C4 (see Figure 1) shall not exceed a maximum of 5% of energy usage, mass, or environmental impact category indicator covered by this **PCR** (see Table 11).
- Conservative assumptions in combination with plausibility considerations and expert judgments should be used to demonstrate compliance with these criteria.

All hazardous and toxic releases (emissions to air, water and/or land) which are mandatory monitored and reported to the U.S TRI or Canadian NPRI on yearly basis shall be included in the inventory and the cut-off rules do not apply [ISO 21930]. The exclusion of any such releases shall be governed by the "threshold of significance" of the laws and regulations applicable in the jurisdiction(s) for which the **LCA** is to be valid. The list of included hazardous and toxic releases, and the applied regulations, shall be documented in the Background Report.

2.1.7 Data Quality Requirements

Data shall be as current as possible. Data sets used for calculations shall have been updated within the last 10 years for generic data and within the last 5 years for manufacturer-specific data.

The specific requirements (e.g. temporal, geographic, and technological quality) and handling of data gaps shall be documented according to ISO 14044. The representativeness of the data used shall be discussed. When data from comparable processes must be used to cover gaps, the technological similarity shall be documented. Handling of data gaps and the use of data models shall be explained.

Data quality requirements shall be treated according to the provisions of ISO 14025 and ISO 14044:2006, Section 4.2.3.6.

2.1.7.1 Period Under Consideration

Data sets shall be based on 1 year averaged data. The period under consideration for the LCA shall be documented. Deviations shall be justified.

2.1.7.2 Generic Data

As a matter of principle, consistent and equivalent generic data shall be used, such as for background processes to support comparability of results. Data sets taken from databases (i.e., sources that are not specific data from the manufacturer) shall be identified as such in the Background Report, including the source and the year at which the dataset was last updated or pre-verified. The representativeness of the datasets with respect to time, location, and technology shall be documented, and deviations from the actual time, location, and technology relevant to the product shall be disclosed.

2.1.7.3 Transport

Transportation distances and methods shall be documented, as far as they are relevant. In addition, the average hauling distance for the distribution chain in North America (gate to site) can be used.

2.1.7.4 Power Mixes

The following applies in selecting the power mix:

- For the United States, the sources for electricity used shall be based on published U.S. government sources for regional grids that are either self-sufficient or net exporters, if available. Site-specific data shall be used for electricity-grid-mix averages. If site-specific data are not available, regional averaged grid-mix values for major grids that are not connected (e.g. East, West, and Texas) shall be used. The sources for electricity and the calculation procedure shall be documented.
- For other regions than the United States, country-specific processes shall be used provided they are representative. For production facilities in several European countries, the applicable power mixes shall be assessed specifically for each country or combined, weighted by production volumes in the respective countries.
- If “green” power is used, certificates must be available for the entire period of EPD validity. If certificates cannot be provided for the full 5 years when issuing the EPD, the **PROGRAM OPERATOR** must request the certificates for the preceding 5 years in order to extend the Declaration.

2.1.8 Units

Table 4 summarizes the mandatory conversion factors to be used by the **PCR** users.

Table 4
Mandatory conversion factors

Convert from (US units)	To (SI units)	Multiply by (3-significant digits)
Pound (lb)	Kilogram (kg)	0.454
British Thermal Unit ^T (BTU)	Joule (J)	1060
Inches (in)	Millimeter (mm)	25.4
Foot (ft)	Meter (m)	0.305
Square foot (ft ²)	Square meter (m ²)	0.0929
Cubic foot (ft ³)	Cubic meter (m ³)	0.0283
Specific density (lb/ft ²)	Specific density (kg/m ²)	4.88
Mile (mi.)	Kilometer (km)	1.61

2.1.9 Inventory Analysis

2.1.9.1 Data Collection

Data collection shall follow the instructions provided in ISO 14044:2006, section 4.3.2.

2.1.9.2 Calculation Procedures

The calculation procedures described in ISO 14044 shall apply. The same calculation procedures shall be applied consistently throughout the **LCA** study. When converting the inputs and outputs of combustible material into energy inputs and outputs, the net calorific value of fuels (Lower Heating Value, LHV) shall be applied according to scientifically based and accepted values specific to the combustible material.

The data collection and calculation procedures shall be documented in the Background Report.

2.1.9.3 Allocation Procedures

For many or most industrial processes more than one input is needed to produce the **BUILDERS HARDWARE** product and sometimes **BUILDERS HARDWARE** Products are co-produced with other products. As a rule the material flows between them are not distributed in a simple way. When dealing with systems involving multiple products and recycling processes, allocation should be avoided as far as possible. Where unavoidable, allocation should be considered carefully and should be justified. The principles for allocation in the **PCR** are based on the guidance given in ISO 14044:2006, Section 4.3.4.

The chosen allocation approaches shall be clearly documented in the Background Report and consistently applied throughout the **LIFE CYCLE ASSESSMENT**. The principle of modularity shall be maintained. Where processes influence the product's environmental performance during its life cycle, they shall be assigned to the Module in the life cycle where they occur. The sum of the allocated inputs and outputs of a **UNIT PROCESS** shall be equal to the inputs and outputs of the **UNIT PROCESS** before allocation. Double-counting or omission of inputs or outputs through allocation is not permitted.

2.1.9.3.1 Allocation Procedure for **CO-PRODUCTS**⁶

Wherever possible, allocation should be avoided by dividing the **UNIT PROCESS** to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes.

Where allocation cannot be avoided, allocation procedures should be carried out as follows [based on ISO 14044:2006, Clause 4.3.4.2]:

The study shall identify the processes shared with other **PRODUCT SYSTEMS** and deal with them according to the stepwise procedure presented below.

a. Where allocation cannot be avoided, the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system. In such a case, any physical parameter, e.g. mass, volume, length, feedstock energy, etc., could be taken into consideration in order to identify the physical parameter which reflects the underlying physical relationship between product and the other **CO-PRODUCTS**.

b. Where physical relationship alone cannot be established or used as the basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between **CO-PRODUCTS** in proportion to the economic value of the products.

Some outputs may be partly **CO-PRODUCTS** and partly disposed **WASTE**. In such cases, it is necessary to identify the ratio between **CO-PRODUCTS** and disposed **WASTE** since the inputs and outputs shall be allocated to the **CO-PRODUCTS** part only.

This **PCR** defines “physical allocation”, such as by mass, as the default allocation procedure for the **BUILDERS HARDWARE** product in Module A-3.

⁶ In industrial processes there may be a wide variety of different types of materials produced in conjunction with the intended product. In business vocabulary, these may be identified as by-products, co-products, intermediate products, non-core products or sub-products. In the PCR these terms are treated as being equivalent. However for the allocation of environmental aspects and impacts a distinction between co-products and products is made in the PCR.

2.1.9.3.2 Allocation Procedure for Reuse, Recycling, and Recovery

The End-of-Life System Boundary of the product is set where outputs of the system under study have reached the end-of-**WASTE** state. Therefore, **WASTE** processing of the material flows (e.g. recycling) during any module of the **PRODUCT SYSTEM** (e.g., during the Product Stage) is included up to the system boundary of that Module

Module D declares potential loads and benefits of **SECONDARY MATERIAL**, **SECONDARY FUEL**, or recovered energy that leaves the System Boundary. Module D recognises the reuse, recycling, and recovery concept by detailing the potential benefits of the avoided future use of primary materials and fuels while taking into account the loads associated with the recycling and recovery processes beyond the System Boundary.

Where a **SECONDARY MATERIAL** or **FUEL** crosses the System Boundary (e.g., if it substitutes for another material or fuel in a following **PRODUCT SYSTEM**), the potential benefits or avoided loads can be calculated based on a specified scenario which is consistent with any other scenario for **WASTE** processing and is based on current average technology or practice.

In module D the net impacts are calculated as follows:

- by adding all output flows of a **SECONDARY MATERIAL** or **FUEL** and subtracting all input flows of this **SECONDARY MATERIAL** or **FUEL** from each sub-module first (e.g. B1-B5, C1-C4, etc.), then from the modules (e.g. B, C), and finally from the total **PRODUCT SYSTEM** thus arriving at net output flows of **SECONDARY MATERIAL** or **FUEL** from the **PRODUCT SYSTEM**;
- by adding the impacts connected to the recycling or recovery processes from beyond the system boundary (after the end-of-**WASTE** state) up to the point that the **SECONDARY MATERIAL** or energy may be substituted for primary production, and subtracting from primary sources the impacts avoided by the substituted production of the **SECONDARY MATERIAL** or the substituted generation of energy;
- by applying a justified value-correction factor to reflect the difference in functional equivalence where the output flow does not reach the functional equivalence of the substituting process.

In module D substitution effects are calculated only for the resulting net output flow.

The amount of **SECONDARY MATERIAL** output, which is for all practical purposes able to replace one to one the input of **SECONDARY MATERIAL** as closed loop, is allocated to the **PRODUCT SYSTEM** under study and not to module D.

Module D also contains the benefits of exported energy from **WASTE** disposal processes declared in module C4.

2.1.10 Environmental Parameters derived from LCA

In conformance with ISO 21930 and EN 15804, this **PCR** covers all required environmental impacts, use of resources, and generation of **WASTE** as specified in Clause 8.2.2, ISO 21930 and Clauses 7.2.2-7.2.5, EN 15804.

2.1.10.1 Parameters Describing Environmental Impacts

Characterization factors from the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.1 July 2012 impact categories) shall be reported. Characterization factors taken from the University of Leiden (CML) methodology are optional additions for EPDs valid in North America but shall be reported for EPDs valid outside of North America).

The following impact assessment indicators shall be calculated and assigned to the **DECLARED** or **FUNCTIONAL UNIT**:

- Global Warming Potential (GWP)
- Ozone Depletion Potential (ODP)
- Acidification Potential (AP)
- Eutrophication Potential (EP)
- Photochemical Ozone / Summer Smog Creation Potential (POCP)
- Abiotic Depletion Potential, ADP-fossil fuels

Optionally, information on further environmental impacts, e.g. abiotic resource depletion, ecotoxicity, human toxicity, land use, etc. can be given.

Apart from the results of the impact estimate, the following must also be stated in the Background Report:

PRODUCT CATEGORY RULE

Builders Hardware
UL 9004

According to ISO 14025

- Reference to all characterization models, characterization factors and characterization methods used, such as those defined in Table 5 of this document or the corresponding from according to CML, and
- A statement that the impact-estimate results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Table 5
Parameters describing environmental impacts

Impact category	Parameter	Unit (per FU or DU)	Source of the characterization method	Level of site specifi- city selected	Environ- mental media
Climate change ^{1,2)}	Global warming potential, GWP	kg CO ₂ – equiv.	TRACI 2.1, July 2012 /IPCC 2007	Global	Air
Ozone depletion ^{1,2)}	Depletion potential of the stratospheric ozone layer, ODP	kg CFC-11 equiv.	TRACI 2.1, July 2012/WMO:2003	Global	Air
Acidification ^{1,2)}	Acidification potential, AP	kg SO ₂ equiv.	TRACI 2.1, July 2012	North America	Air, Water
Eutrophication ^{1,2)}	Eutrophication potential, EP	kg N equiv.	TRACI 2.1, July 2012	North America	Air, Water
Smog ^{1,2)}	Photochemical ozone creation potential, POCP	kg O ₃ equiv.	TRACI 2.1, July 2012	North America	Air
Depletion of abiotic resources – fossil fuels ²⁾	Abiotic Depletion potential, ADP-fossil fuels	MJ surplus energy ⁴⁾	TRACI 2.1, July 2012 /eco-indicator 99 LCIA methodology ³⁾	Global	Natural resources

Notes:

(1) Required in ISO 21930, Clause 8.2.2.1.

(2) Required in EN 15804 Clause 7.2.3.

(3) A non site-specific recommendation for fossil fuel use characterization was included within the original version of TRACI (Bare et al. 2003, Goedkoop&Spriensma 1999) and this reference methodology is maintained within the release of TRACI 2.1, July 2012 [U.S EPA 2012].

(4) Surplus energy per extracted MJ, kg or m3 fossil fuel, as a result of lower quality resources.

2.1.10.2 Parameters Describing Resource Use

The following parameters derived from LCI describing resource use shall be calculated and assigned to the **DECLARED** or **FUNCTIONAL UNIT** of product.

Table 6
LIFE CYCLE INVENTORY ANALYSIS parameters describing the use of resources

Use of RENEWABLE primary energy excluding the RENEWABLE primary energy used as raw materials	MJ, net calorific value (LHV)
Use of RENEWABLE primary energy resources used as raw materials	MJ, net calorific value
Total use of RENEWABLE primary energy (primary energy and RENEWABLE primary energy resources used as raw materials)	MJ, net calorific value
Use of NON-RENEWABLE primary energy excluding the NON-RENEWABLE primary energy resources used as raw materials	MJ, net calorific value
Use of NON-RENEWABLE primary energy resources use as raw materials	MJ, net calorific value
Total use of NON-RENEWABLE primary energy (primary energy and NON-RENEWABLE primary energy resources used as raw materials)	MJ, net calorific value
Use of SECONDARY MATERIALS	kg
Use of RENEWABLE SECONDARY FUELS	MJ, net calorific value
Use of NON-RENEWABLE SECONDARY FUELS	MJ, net calorific value
Use of fresh water resources	m ³

SECONDARY FUELS are all combustible materials which were recovered from a previous use or from **WASTE** from a previous **PRODUCT SYSTEM** and are used as fuel in a following **PRODUCT SYSTEM**.

2.1.10.3 Other Environmental Information Describing Different **WASTE** Categories and Output Flows

The following parameters derived from LCI describing different **WASTE** categories and output flows shall be calculated and assigned to the **DECLARED** or **FUNCTIONAL UNIT** of product.

Table 7
LIFE CYCLE INVENTORY ANALYSIS parameters describing various WASTE categories

Disposed-of hazardous WASTE	kg
Disposed-of non-hazardous WASTE	kg
Disposed-of radioactive WASTE	kg

Table 8
LIFE CYCLE INVENTORY ANALYSIS parameters describing the output flows

Components for reuse	kg
Materials for recycling	kg
Materials for energy recovery	kg
Exported electrical energy	MJ, net calorific value per energy carrier
Exported thermal energy	MJ, net calorific value per energy carrier

The above parameters quantify the material flows once they have both reached the End-of-**WASTE** State and left the System Boundary. The “materials for energy recovery” parameter does not include materials for **WASTE** incineration. **WASTE** incineration is regarded as a **WASTE** processing process and remains within the System Boundary.

2.1.11 Additional Technical and Environmental Information

For technical information, please refer to section 3.2.5 Technical Information

2.1.11.1 CO₂ Certificates

THIRD PARTY-verified CO₂ certificates can be credited in EPDs. EPDs are always valid for a period of 5 years. The **BUILDERS HARDWARE** product manufacturer must provide evidence of discontinuation of CO₂ pollution rights in order to obtain credit for the entire period of EPD validity or any part thereof. If CO₂ certificates are only provided for one year, either one-fifth can be incorporated in the annual report or the validity of the certificate is limited to one year and can only be extended unchanged following presentation of the certificates.

2.1.12 Ownership, Responsibility, and Liability for the EPD

As per Section 5.5 of EN 15804, a manufacturer or a group of manufacturers is the sole owner and has liability and responsibility for an EPD.

2.1.13 Verification and Validity of an EPD

As per Section 9 of EN 15804, after verification an EPD is valid for a 5 year period from the date of issue, after which it shall be reviewed and re-verified. An EPD shall only be reassessed and updated as necessary to reflect changes in technology or other circumstances that could alter the content and accuracy of the declaration. An EPD does not have to be recalculated after 5 years if the environmental performances of a **BUILDERS HARDWARE** product have not changed significantly.

A significant change in the environmental performance of a **BUILDERS HARDWARE** product that must be reported to the verifier is $\pm 10\%$ on any one of the total declared parameters of the EPD (see Tables 5-8). Such a change may require an update of the EPD.

The process for verification and establishing the validity of an EPD shall be in accordance with ISO 14025 and ISO 21930.

2.2 Rules for Creating the Background Report

2.2.1 The Content, Structure, and Accessibility of the LCA Background Report

The Background Report is a systematic and comprehensive summary of the project documentation based on the rules for completing the LCA according to the PCR to support the certification of the EPD. The Background Report must be prepared so as to demonstrate to the verifier that the LCA prepared according to the information required by this PCR, and the EPD document deriving from it, complies with ISO 14025, ISO 14040-44, ISO 21930, and EN 15804.

The Background Report shall include all data and information required by the PCR. The Background Report must be submitted to the verifier under confidentiality (see ISO 14025). The Background Report is not part of the EPD and will not be made publically available by the verifier.

2.2.2 General Information in the Background Report

The Background Report must contain the following general information:

- Commissioner of the LCA study and the organization conducting the LCA study,
- Reporting date,
- The reasons for conducting the study,
- The intended application,
- The target group/audience (i.e., is the EPD intended for business-to-business and/or business-to-consumer communication), and
- Evidence that the LCA study was completed in accordance with the requirements of these PRODUCT CATEGORY RULES with reference to ISO 14040-44 series of standards, ISO 14025, ISO 21930, and EN15804 if applicable.

2.2.3 Scope of the study

2.2.3.1 DECLARED/FUNCTIONAL UNIT

This includes the following:

- Definition, including any relevant technical specification(s)

- Calculation rule for averaging data, when the **DECLARED/FUNCTIONAL UNIT** is defined for:
 - (i) A group of similar products produced by different suppliers; or
 - (ii) The same product produced at different production sites.

2.2.3.2 Description of the System Boundary

The description of the System Boundary, using a modular approach as outlined in Figure 1, includes the following elements:

- An analysis period for each of the modules considered in the **LCA**
- A flow chart showing the energy and material inputs and outputs, taking into consideration how plant-level data are allocated to the **BUILDERS HARDWARE** product(s)
- Statement of the omissions of life cycle stages, processes, if any
- Assumptions about power generation, including reference year
- Offsetting methods for possible CO₂ certificates
- Assumptions about other background data relevant for describing the System Boundary

2.2.3.3 Explanation of Exclusion of Inputs and Outputs

Exclusions shall not be used in order to hide unfavorable data and shall be governed by the cut-off criteria.

The following procedure shall be followed for the exclusion of inputs and outputs:

- All inputs to and outputs from a **UNIT PROCESS** for which data are readily available shall be included in the calculation. Data gaps may be filled by conservative assumptions of average or generic data following the requirements in Section 2.1.9. Any such assumptions or use of generic data shall be documented in the Background Report.
- In the event of insufficient input data or data gaps for a **UNIT PROCESS**, the cut-off criterion shall be 1% of **RENEWABLE** and **NON-RENEWABLE** primary energy usage or 1% of the total mass of this **UNIT PROCESS**. The total neglected input flows, e.g. per Module A, B, C or D shall be a maximum of 5% of energy usage or mass.
- Particular care should be taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental impact indicators of this standard.

- Conservative, plausible assumptions and expert judgement can be used to demonstrate compliance with these criteria, and these and the sources must be given.
- Application of the cut-off criteria shall be documented in the Background Report:
 - Description of the application of cut-off criteria and assumptions, and
 - List of processes not taken into consideration.

2.2.4 Inventory Analysis

The data collection and calculation procedures shall be documented in the Background Report and shall include the following:

- Qualitative/quantitative description of **UNIT PROCESSES** necessary to model the life cycle stages of the **DECLARED UNIT**, taking into account the provisions of EN ISO 14025 regarding data confidentiality;
- Sources of generic data or literature used to conduct the **LCA**;
- Validation of data, including:
 - (i) Data quality assessment;
 - (ii) Treatment of missing data;
- Allocation principles and procedures, including:
 - (i) Documentation and justification of allocation procedures;
 - (ii) Uniform application of allocation procedures;

2.2.4.1 Description of **UNIT PROCESSES**

Document transparently the modelling of the **UNIT PROCESSES** underlying the **LCA**. This can be done in tabular form or with the help of flow-charts such as screenshots from **LCA** software.

Explain handling of data gaps and models. If several products are declared in one EPD or if one product is produced at several locations, model each product or location, and weight of the data, documenting accordingly.

2.2.4.2 Description of Allocation Procedures

Describe allocations made:

- in the use of **SECONDARY MATERIALS** as raw materials
- delineating **BUILDERS HARDWARE** product(s) from other products manufactured in the plant
- of multi-input processes if included in the **LCA**

- of reuse, recycling, and energy recovery

The allocation procedure selected must be justified and the allocation procedure used must follow the requirements as described in Section 2.1.9.3, and must be uniformly applied and documented.

2.2.5 LIFE CYCLE IMPACT ASSESSMENT

The Background Report must include:

- the **LCIA** procedures, calculations, and results of the study
- the relationship of the **LCIA** results to the **LCI** results
- reference to all characterization models, characterization factors and characterization methods used
- a statement that the **LCIA** results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks

2.2.6 Interpretation of the Results

Interpret the **LCIA** and the calculated impact indicators for the **DECLARED** or **FUNCTIONAL UNIT**, providing at least:

- Interpretation of the results based on a **DOMINANCE ANALYSIS** of indicators (for the relevant Modules)
- Assumptions and limitations associated with the interpretation of results as declared in an EPD, both methodology and data-related
- The variance from the means of **LCIA** results should be described if generic data are declared from several sources or for a range of similar products
- Data quality assessment
- Full transparency in terms of value choices, rationales, and expert judgements that may have affected the **LCA**.

The influence of assumptions due to data gaps or other uncertainties should be assessed with a sensitivity analysis, as far as the assumptions are relevant to the result.

2.2.7 Documentation of Additional Information

The Background Report shall include any documentation on any additional environmental information declared in an EPD. Such documentation may be supplied as copies to the verifier, for example:

- Laboratory results/measurements for the content declared (i.e. recycled content)
- Laboratory results/measurements of functional/technical performance
- Documentation on declared technical information on individual life cycle stages that have not been considered in the LCA of the product and that will be used for the assessment of buildings (e.g., transport distances, cleaning cycles, recycling programs, etc.)
- Laboratory results/measurements for the declaration of emissions to indoor air, soil and water during the product's Use Stage

3.0 Content of the Environmental Product Declaration

The following describes the format and information for creating an EPD for **BUILDERS HARDWARE**.

3.1 Content of the EPD

3.1.1 Summary

The summary must contain the following elements:

- Product name (including product code(s) where applicable)
- Declaration holder: the manufacturer completing the EPD
- Full name, logo, and website of **PROGRAM OPERATOR**
- Declaration number as provided by the **PROGRAM OPERATOR**
- Date of issuance
- End date of validity period (5 years after issuance)
- Reference **PCR** (name, version)
- Signature of the **LCA** and EPD verifiers
- Outline of the content in the EPD

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- EPD type shall be declared and shall specify which life-cycle stages are not considered, if the EPD is not based on an LCA covering all stages
- Explanatory information about the EPD content can be obtained at (<http://www.ul.com/global/eng/pages/offerings/businesses/environment/services/certification/epd/index.jsp>) or send an email to epd@ul.com
- Optional: product image(s)
- The information from Table 9 must be included⁷:

Table 9
THIRD PARTY verification

<p>PCR REVIEW, was conducted by:</p> <p><name and organization of the chairman, and information on how to contact the chairman through the PROGRAM OPERATOR></p>
<p>Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007</p> <p>internal external</p>
<p>(Where appropriate) Third-Party verifier:</p> <p><name of the Third-Party verifier></p>

The header must contain the following elements:

- Declaration Holder (i.e. the manufacturer completing the EPD)
- Product name (product number)
- The statement: “according to ISO 14025”
- Declaration number
- Date of issuance

3.2 Product Description

The **BUILDERS HARDWARE** product(s) must be described and description shall contain all the information required in Section 2.1.3, Product Description. The **BUILDERS HARDWARE** product shall be described by its technical and functional properties and its application ranges. The description is also to identify the grade of the **BUILDERS HARDWARE** product and state it’s **RSL**.

⁷ As specified in ISO 14025, Clause 9.4 and ISO 21930, Clause 5.4, third party verification is optional for B to B communication and mandatory for B to C communication.

The **LCA** can be conducted for either an average product or a specific product. In the case where an **LCA** is calculated as average environmental performance for **BUILDERS HARDWARE** product(s) a statement to that effect shall be included in the EPD together with a description of the range of variation of the **LCIA** results. For products produced in multiple locations, the locations of the manufacturer's factories/plants shall be reported in the declaration.

The product description must clearly state if the product is:

- A specific product from a specific factory/plant of a manufacturer
- A specific product as an average from several of the manufacturer's plants
- An average product from a manufacturer's plant
- An average product from several of the manufacturer's plants
- A specific product as an average from several manufacturers' plants
- An average product as an average from several manufacturers' plants

The EPD shall state the geographic regions for which the **LCA** is representative. In the case where an EPD declares an average environmental performance for a number of products a statement to that effect shall be included in the declaration together with a description of the range/ variability of the **LCIA** results if significant.

3.2.1 Product Characterization

The **BUILDERS HARDWARE** product(s) must be described. This description includes the condition in which the product is provided to the customer, any installation services, and secondary equipment such as accessories, manuals, etc. must be indicated.

3.2.2 Application

The application for the **BUILDERS HARDWARE** product(s) must be specified. The applicable standard(s) and/or general technical approval or applicable national regulation(s) must be stated.

3.2.3 Technical Information

The technical information as contained on the manufacturer's Technical Data Sheet must be provided, with reference to the test standard if applicable, for the **BUILDERS HARDWARE** product. Dimensions are to be expressed per **FUNCTIONAL UNIT** or per **DECLARED UNIT**.

3.2.4 Placing on the Market/ Application Rules

State the relevant ANSI/BHMA standard(s) and/or general technical approval or comparable national regulation. Standards must be quoted as illustrated in the example shown:

e.g. ANSI/BHMA A156.12-2013 Butts & Hinges

3.2.5 Delivery Status

State the dimensions/quantities of products declared as delivered to the customer.

3.2.6 Base Materials / ANCILLARY Materials

The product's material composition given as mass percent to enable the user of the EPD to understand the composition of the product as-delivered. For confidentiality reasons, the declaration of the product formulation is optional for specific product and manufacturer EPDs. Either the product formulation or the SDS of the product must be reported, where required by regulation.

3.2.7 Manufacture

The manufacturing process must be described and can be illustrated using a simple graphic. If the EPD applies for several locations, the production processes for all locations must be described. Quality management systems may optionally be referred to.

3.2.8 Environment and Health During Manufacturing

Declaration of the environmental pollution abatement equipment installed at the surveyed plants, for example to control particulate matter (PM) emissions, is optional. Any other environmentally friendly practice dealing with emissions to air, water, and soil, or to **WASTE** treatment, may be reported as well. If an Environment Management System is in place it may be referred to.

3.2.9 Packaging

Describe product-specific packaging: type, composition, and possible reuse of packaging materials (paper, pallets, films, etc.).

3.2.10 Product Installation

Describe the methods, machinery, tools, **ANCILLARY** materials, dust extraction, noise reduction, etc. to be used during product installation.

3.2.11 Condition of Use

If applicable, describe special features of product for the period of use that have not been discussed elsewhere in the EPD.

3.2.12 Environment and Health During Use

Information on the relationships between products, the environment, and health; possible content of harmful substances or emissions including radiation. Any recommendations concerning cleaning, maintenance, etc., of the **BUILDERS HARDWARE** product should be listed in this section.

3.2.13 REFERENCE SERVICE LIFE (RSL)

The RSL shall only be specified by the manufacturer for “Cradle-to-building- with Use Stage (Option 3)” and “Cradle-to-grave” type of EPDs (see Table 3 and section 2.1.4).

3.2.14 Extraordinary effects (Optional)

3.2.14.1 Fire

The information in Table 10 on fire performance according to UL 10B or UL 10C or other established national standards.

Table 10
Fire protection

Fire Protection	Value
Building Material Class	
Burning Droplets	
Smoke Gas Development	

3.2.14.2 Water

Provide information on product performance including possible impacts on the environment following unforeseeable influence of water, e.g. flooding, in this section.

3.2.15 Re-Use Stage

The possibilities of re-use, recycling, and energy recovery must be described in this section.

3.2.16 Disposal

The possible disposal practices must be indicated.

3.2.17 Additional Information

Optionally, such details as reference source for additional information, e.g., homepage, or reference source for Safety Data Sheet (SDS).

3.3 LIFE CYCLE ASSESSMENT

3.3.1 DECLARED UNIT / FUNCTIONAL UNIT

State either the **DECLARED UNIT** or **FUNCTIONAL UNIT** as described in Section 2.1.2, as appropriate for the selected EPD type. The section is also to include a description of the grade of the product and, if applicable, it's **RSL**.

3.3.2 System Boundary

Describe the System Boundary as required in Section 2.1.5.

3.3.3 Estimates and Assumptions

Describe in this section of the EPD the key assumptions and estimates for interpretation of the LCA.

3.3.4 Cut-off Criteria

Document the use of cut-off limits as per Section 2.1.6 here.

3.3.5 Background Data

Provide the sources for background data used, as described in Section 2.1.9

3.3.6 Data Quality

Include a summary of the data quality requirements as documented in the Background Report described in Section 2.1.7.

3.3.7 Period Under Consideration

Use average values over a period of twelve months of the quantities of raw materials, energies, **ANCILLARY** materials, and supplies used by the producing plants. Document any deviations from the 12 month period in this section.

3.3.8 Allocation

Justify, describe, and document the allocation procedure, if any, and its uniform application.

3.3.9 LCA Results

In Table 11, Part A, "Description of the System Boundary" below, all declared Modules shall be indicated with an "X"; all Modules that are not declared shall be indicated with "MND". In Table 11 Part B, C and D columns may be deleted for Modules that are not declared.

Indicator values should be declared with three significant digits in exponential form (e.g. $1.23E-5 = 0.0000123$). A uniform format should be used for all values of one indicator. If several Modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names. The **RSL** for modules B1 through B7 must correspond with the grade of the product as stated in section 3.3.1.

Report characterization factors from the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.1 impact categories). Characterization factors taken from the University of Leiden (CML) methodology are optional and shall only be reported for EPDs used outside of North America.

Table 11
LCA results

Part A- Description of the system boundary (X: included in LCA; MND- module not declared)																			
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
X	X	X	X	X		MND	MND	MND	MND	MND		MND	MND	MND	MND				
Part B- LIFE CYCLE IMPACT ASSESSMENT Results																			
DECLARED UNIT or FUNCTIONAL UNIT: [Insert DECLARED UNIT]																			
Part B.1 Impact Assessment Methodology: TRACI 2.1												Modules included in LCA: (to be reported below)			UNITs				
GWP		Global warming potential													kg CO ₂ Eq.				
ODP		Depletion potential of the stratospheric ozone layer													kg CFC 11 Eq.				
AP		Acidification potential													kg SO ₂ Eq.				
EP		Eutrophication potential													kg N Eq.				
POCP		Photochemical ozone creation potential													kg O ₃ Eq.				
ADPF		Abiotic depletion potential for fossil resources													MJ surplus energy				

PRODUCT CATEGORY RULE

Builders Hardware
UL 9004

According to ISO 14025

Part B.2- Impact Assessment Methodology: CML (optional)		Modules included in LCA: (to be reported below)	UNITs
GWP	Global Warming Potential		kg CO ₂ Eq.
ODP	Depletion potential of stratospheric ozone layer		kg CFC-11 Eq.
AP	Acidification potential		kg SO ₂ Eq.
EP	Eutrophication potential		kg (PO ₄) ³⁻ Eq.
POCP	Photochemical ozone creation potential		kg ethane Eq.
ADPE	Abiotic depletion potential for non-fossil resources		kg Sb Eq.
ADPF	Abiotic depletion potential for fossil resources		MJ surplus energy
Part C- Resource Use		Modules included in LCA: (to be reported below)	UNITs
PERE	Use of RENEWABLE primary energy excluding the RENEWABLE primary energy used as raw materials		MJ
PERM	Use of RENEWABLE primary energy resources used as raw materials		MJ
PERT	Total use of RENEWABLE primary energy (primary energy and RENEWABLE primary energy resources used as raw materials)		MJ
PENRE	Use of NON-RENEWABLE primary energy excluding the NON-RENEWABLE primary energy resources used as raw materials		MJ
PENRM	Use of NON-RENEWABLE primary energy resources use as raw materials		MJ
PENRM	Total use of NON-RENEWABLE primary energy (primary energy and NON-RENEWABLE primary energy resources used as raw materials)		MJ
SM	Use of SECONDARY MATERIALS		kg

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RSF	Use of RENEWABLE SECONDARY FUELS		MJ
NRSF	Use of NON-RENEWABLE SECONDARY FUELS		MJ
FW	Use of FRESH WATER resources		m ³
Part D- Output Flows and WASTE Categories		Modules included in LCA: (to be reported below)	UNITs
HWD	Disposed-of-hazardous WASTE		kg
NHWD	Disposed-of non-hazardous WASTE		kg
RWD	Disposed-of Radioactive WASTE		kg
CRU	Components for reuse		kg
MFR	Materials for recycling		kg
MET	Materials for energy recovery		kg
EEE	Exported electrical energy		MJ
EET	Exported thermal energy		MJ

3.3.9.1 Comparability of EPDs

EPDs must not contain statements of the superiority of one product over a competitor's product that performs the same functions, or of one manufacturer against another. **BUILDERS HARDWARE** EPDs must not contain directly or indirectly such **COMPARATIVE ASSERTIONS**.

The following ISO statements indicate the EPD comparability limitations and intent to avoid any market distortions or misinterpretation of EPDs based on this **BUILDERS HARDWARE PCR**:

ISO 14025 requires this statement be included: "Environmental declarations from different programs may not be comparable".

In conformance with ISO 21930, Clause 5.6, a statement should be included that indicates, "the comparison of the environmental performance of **BUILDERS HARDWARE** using the EPD information shall be based on the product's use in and it's impacts on or within the building, and shall consider the complete life cycle with all **INFORMATION MODULES**".

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All **BUILDERS HARDWARE** EPDs that include Use Stage should include this statement: “Use-Stage impacts of the - **IBTS** are modeled for a specific scenario and are only comparable with products developed using the exact same Use Stage scenario”.

This statement must be included: “Full conformance with the **PCR** for North American **BUILDERS HARDWARE** products allows EPD comparability only when all stages of a **BUILDERS HARDWARE** product’s life cycle have been considered. However, variations and deviations are possible”. Example of variations: Different **LCA** software may lead to differences in **LCI** data quality upstream or downstream of the Stages declared.

The EPD owner shall transparently indicate any comparability limitations here. For example, any deviation from the **PCR** requirements must be stated.

3.3.10 LIFE CYCLE ASSESSMENT Interpretation

To facilitate comprehension of the **LCA**, both the aggregate indicators of the **LCI** and the estimated impact outlined in Section 5 “**LCA** results” must be interpreted. This interpretation must also include a description of the time frame and/or variation of the **LCIA** results if the EPD is for several products. An illustration of the results with figures is recommended. For example, the **DOMINANCE ANALYSIS** or the distribution of impacts across the Modules, or others should be provided, as appropriate for a reader's understanding of the environmental profile of the **BUILDERS HARDWARE** product.

3.3.11 Other Required Evidence

As a general rule, all statements must be documented with measured data and supported by the corresponding test certificates. In the case of substances which are declared “not detectable”, the limit of detection must be stated. The methods of evidence and the test conditions are to be indicated. Interpreting statements such as “... free of ...” or “... are entirely harmless ...” are not permissible. If evidence is not provided the reasons are to be indicated in the EPD.

3.4 LCA Scenarios and Additional Technical Information

Table 12
LCA scenarios and additional technical information

A4 module- Construction stage - Transport to the Building Site	Value	Dimensions
Fuel type and consumption of vehicle or vehicle type used for transport; e.g., long distance truck, ship, etc.		Liter of fuel type per distance or vehicle type
Transport Distance		km
Capacity utilization (including empty runs)		%
Bulk density of transported products		kg/m ³
Volume capacity utilization factor (factor: =1 or <1 or 1 for compressed or nested packaged products)		-
A4 module- Construction stage - Installation into the Building	Value	Dimensions
ANCILLARY materials for installation (specified by material)		kg and dimensions as appropriate
WATER CONSUMPTION		m ³
Other resources		kg
Quantitative description of energy type (regional mix) and consumption during the installation process		kWh or MJ
WASTE materials on the building site before WASTE processing, generated by the product's installation (specified by type)		kg
Output materials (specified by type) as result of WASTE processing at the building site; e.g., of collection for recycling, for energy recovery, disposal (specified by route)		kg
Direct emissions to ambient air, soil and water		kg

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According to ISO 14025

Use Stage	Value	Dimensions
<i>B1 module- Use of the installed product</i> <i>Information on B1 is covered under Section 3.2.12</i>		
<i>B2 module- Use Stage- Maintenance</i>		
Maintenance process	Description or source where description can be found	
Maintenance cycle (e.g., number of battery changes and batteries per RSL)		number per RSL , or interval
Net WATER CONSUMPTION during maintenance		m ³
ANCILLARY materials for maintenance; e.g., cleaning agent, specify materials		kg/cycle
Energy input during maintenance; e.g., vacuum cleaning, energy carrier type, e.g. electricity; and amount		kWh or MJ
WASTE material resulting from maintenance (specify materials)		kg
<i>B3 module- Use stage- Repair</i>		
Repair process	Description or source where description can be found	
Inspection process	Description or source where description can be found	
Repair cycle		number per RSL , or interval
WATER CONSUMPTION		m ³
ANCILLARY materials, e.g., lubricant; specify materials		Kg
Energy input during repair, e.g., energy carrier type, , welding gases, and amount		kWh
WASTE material resulting from repair, (specify materials)		Kg
<i>B4/B5 module- Use stage- Replacement/Refurbishment</i>		
Replacement cycle		number per RSL , or

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		interval
Energy input during replacement e.g. energy carrier type, e.g., electricity, welding gases; and amount, if applicable and significant		kWh
Exchange of worn parts during the product's life cycle, e.g., zinc galvanized steel sheet. Specify materials		Kg
B6 and B7 module- Use stage-Operational Energy and Water Use (Building ESL = 60 years)	Value	Dimensions
ANCILLARY materials specified by material		kg or dimensions as appropriate
Net WATER CONSUMPTION		m ³
Type of energy carrier, e.g., electricity, natural gas, district heating		kWh
Power output of equipment		kW
Characteristic performance, e.g., energy efficiency, emissions, variation of performance with capacity utilization, etc.		dimensions as appropriate
Further assumptions for scenario development, e.g., frequency and period of use, number of occupants		dimensions as appropriate
C1-C4 module- End-of-Life	Value	Dimensions
WASTE collected separately		kg
WASTE collected with mixed construction WASTE		kg
Reuse		kg
Recycling		kg
Energy Recovery		kg
Landfilling		kg

3.5 References

The literature referred to in the EPD must be cited in full. Standards relating to evidence and/or technical features already fully quoted in the EPD do not need to be listed here.

3.6 Verification

The verification of the EPD shall record that the **LCA**-based information and the additional information as declared in the EPD meet the requirements of ISO 14025.