



NSF Product Category Rule
for Environmental Product Declarations

NSF 1122-26

BIFMA Storage

Sub-category PCR, UNCPC 3812,
Version 3.0

Program Operator: NSF
National Center for Sustainability Standards
Valid through July 10, 2031
ncss@nsf.org

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NSF National Center for Sustainability Standards
789 North Dixboro Road, PO Box 130140
Ann Arbor, Michigan 48113-0140 USA
Phone: (734) 769-8010 Email: ncss@nsf.org
Web: [<nsf.org>](http://nsf.org)

Valid through July 10, 2031

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Program Operator

NSF

Revised by NSF staff with assistance from the
NSF Product Category Rules BIFMA Committee

Chair

Alex Mlsna, Kimball International

Academia

Allen Luccitti, Rochester Institute of Technology – Goisano Institute for Sustainability

Industry

Katie Chapman, Haworth
Jaison Jacob, MillerKnoll
Ana Maria Leal, Steelcase Inc.

User

Beth Cassese, SCS Global Services (until November 2025), Horizon LCA (November 2025 - present)
Steve Kooy, BIFMA
Sarah Meagrow, NSF
Lucas Wathen, SCS Global Services

LCA Expertise

Beth Cassese, SCS Global Services (until November 2025), Horizon LCA (November 2025 - present)
Alex Mlsna, Kimball International
Lydia Schreiber, WAP

NSF Staff

Shannon McCormick, Standards Specialist (Secretariat)

Product Category Rules Independent Review Panel

Thomas P. Gloria, PhD, Industrial Ecology Consultants (Chair)
Jack Geibig, PE, Ecoform
Bill Stough, MM, Bill Stough, LLC

PCR review panel comments may be obtained by contacting NSF's National Center for Sustainability Standards at ncss@nsf.org.

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3.0	Revision	July 2026

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Unit abbreviations

The following table is provided as a reference for unit abbreviations for common forms of measurement used within NSF documents.

Time	second	s
	minute	min
	hour	h
	day	d
	week	wk
	month	mo
	year	yr
Length	inch	in.
	foot	ft
	yard	yd
	micrometer	µm
	nanometer	nm
	millimeter	mm
	centimeter	cm
	meter	m
	kilometer	km
	miles	mi
Liquid measure	milliliter	mL
	liter	L
	liters per day	LPD
	liters per minute	LPM
	ounce	oz
	pint	pt
	quart	qt
	gallon	gal
	gallons per minute	GPM
	gallons per day	GPD
Weight	microgram	µg
	picogram	pg
	nanogram	ng
	milligram	mg
	centigram	cg
	gram	g
	kilogram	kg
	pound	lb
	ton	t
	metric ton	mt

Miscellaneous	British thermal unit	BTU
	kilowatt hours	kWh
	parts per million	ppm
	megajoule	MJ

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Foreword

These product category rules shall be used in preparing an Environmental Product Declaration (EPD) for storage products. This version supersedes Version 2.0 and is valid through July 10, 2031.

This edition of the PCR contains the following revisions:

- cover-to-cover revision meant to clean up language to improve clarity and consistency.

Suggestions for improvement of this guideline are welcome. Comments should be sent to ncss@nsf.org, or c/o NSF, National Center for Sustainability Standards, PO Box 130140, Ann Arbor, Michigan 48113-0140, USA.

About Business + Institutional Furniture Manufacturers Association (BIFMA)

BIFMA is the not-for-profit trade association for business and institutional furniture manufacturers. Since 1973, BIFMA has been the voice of the commercial furniture industry. Our industry's service to our customers—providing healthy, comfortable and productive workspaces—rests on an infrastructure of engineering and material standards. These standards, founded on centuries of craft and enhanced by ever-advancing science, embody the best of our knowledge regarding safety, ergonomics, and sustainability.

BIFMA's role is to sponsor the development and refining of current and future standards, educate on their importance and application, and translate their necessary complexity into more easily understood and implemented formats. We also monitor the state of the industry, serve as a forum for member cooperation and collaboration, interact with international counterparts, and advocate for regulatory conditions that foster value and innovation. Visit bifma.org or contact email@bifma.org.

About the NSF National Center for Sustainability Standards (NCSS)

Through the National Center for Sustainability Standards, NSF develops life cycle-based, multi-attribute sustainability standards, protocols, and PCRs for various industries including building products and materials, furniture, carpet and flooring, fabrics, wallcoverings, roofing membranes, green chemicals, electronics, and water and wastewater.

The National Center for Sustainability Standards will continue to add to its growing portfolio while providing education, outreach, and innovation support to private industry, trade associations, government and academia to foster a consensus-based approach toward conformity assessment in the sustainability field. Visit nsfsustainability.org or contact ncss@nsf.org.

NSF Product Category Rule for Environmental Product Declarations –

BIFMA Storage Sub-category PCR, UNCPC 3812, Version 3.0

1 Scope

Per ISO 21930:2017 ¹ Clause 1, with the following additions:

This PCR applies to products that provide the function of storage, a sub-category of furniture. Other functions that the product may provide are not considered herein. Utilizing the UN Central Product Classification for this PCR, the Class is 3812 for Other Furniture, of a kind used in offices. This PCR includes sub-classes 38121 - Other Metal Furniture, of a kind used in offices, and 38122 - Other Wooden Furniture, of the kind used in offices, as each appropriately applies to the function of storage. This PCR includes the manufacture of storage products constructed from singular or multiple materials including, but not limited to solid wood, metal, plastic, composite wood (e.g. particle board, MDF), bio-based materials, or mixtures of other materials, solid surface (e.g. glass, stonework, composite materials, or others), surface materials (e.g. laminates, veneers, metallic, fabric), and separate materials including foam, fiberglass, fiberboard, etc. If the primary function of the product is something other than for storage (e.g. a bench intended for seating yet has additional function, including storage capacity) then this PCR shall not be used for that product. This PCR enables the development of EPDs associated with the production of Storage from cradle-to-gate with options for life cycle stage modules as follows:

- A1-A3, B1-B5, and C1-C4 are required
- A4-A5 and D are optional
- B6-B7 are not declared.

While this PCR will likely be used primarily in North America, it may be used in other regions where program operators deem it appropriate.

This PCR is valid through July 10, 2031.

2 Normative references

The following documents are referred to in the text. For undated references, the latest edition of the referenced document (including any amendments) applies.

ACLCA, *Guidance for Determining EPD Types and Calculating and Communicating Data Specificity Through the Supply Chain* ²

¹ International Organization for Standardization. Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland. <[iso.org](https://www.iso.org)>

² American Center for Life Cycle Assessment. 6900 Wisconsin Avenue, Unit 30953, Bethesda, MD 20824. <[aclca.org](https://www.aclca.org)>

ACLCA, *Guidance for Quantifying Renewable Electricity Instruments in Environmental Product Declarations (EPDs)*²

AF&PA, *Life Cycle Inventory Analysis: Enhanced Methods and Applications for the Products of the Forest Industry*. The International Working Group, 2006³

ANSI/BIFMA e3, *Furniture Sustainability Standard*⁴

ANSI/BIFMA X5.9, *Storage Units*⁴

FTC Part 260, *Green Guides*⁵

Intergovernmental Panel on Climate Change⁶

ISO 14025:2006, *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*¹

ISO 14040:2006/AMD 1:2020, *Environmental management – Life cycle assessment – Principles and framework*¹

ISO 14044:2006/AMD 1:2007/AMD 2:2020, *Environmental management – Life cycle assessment – Requirements and guidelines*¹

ISO 21930:2017, *Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services*¹

JRC-IES, *International Reference Life Cycle Data System (ILCD) Handbook: General Guide for Life Cycle Assessment*, 2010⁷

NSF, *Product Category Rules Program General Program Instructions*⁸

US EPA, *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008*⁹

US EPA, *Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI 2.2)*¹⁰

US EPA, *Waste Reduction Model*¹¹

³ American Forest & Paper Association. 601 Thirteenth Street NW, Suite 1000 N, Washington, DC 20005 <afandpa.org>

⁴ Business + Institutional Furniture Manufacturers Association. 678 Front Avenue NW, Suite 150, Grand Rapids, MI 49504. <bifma.org>

⁵ Federal Trade Commission. 600 Pennsylvania Avenue, NW, Washington, DC 20580. <ftc.gov>

⁶ World Meteorological Organization (secretariat to IPCC), 7bis Avenue de la Paix, CP 2300, CH- 1211 Geneva 2, Switzerland. <ipcc.ch>

⁷ European Commission, Joint Research Centre, Institute for Environment and Sustainability. First edition, March 2010. EUR 24708 EN, Luxembourg. Publications office of the European Union. <eplca.jrc.ec.europa.eu>

⁸ Available upon request from ncss@nsf.org.

⁹ US EPA, Office of Resource Conservation and Recovery. 1200 Pennsylvania Avenue NW, Washington, DC 20004. <archive.epa.gov/epawaste/nonhaz/municipal/web/pdf/msw2008rpt.pdf>

¹⁰ US EPA, Office of Science. Mail Drop: D343.04, 109 Alexander Drive, Durham, NC 27771. <epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci>

¹¹ US EPA, Office of Resource Conservation and Recovery. 1200 Pennsylvania Avenue NW, Washington DC 20004. <epa.gov/warm>

USLCI, *Database Project Development Guidelines* ¹²

World Business Council for Sustainable Development, *Global Water Tool* ¹³

WRI, *Greenhouse Gas Protocol, Product Life Cycle Accounting and Reporting Standard* ¹⁴

3 Definitions

Per ISO 21930:2017¹ Clause 3, with the following additions:

adders: Refers to orderable options that are physically attached to the declared (functional) unit used in the study. Such adders could include a privacy or modesty screen/panel, monitor arms, etc. Adders are optional components that would have an environmental impact greater than allowed per Section [7.1.3](#).

business-to-business (B2B): Describes commerce transactions between businesses, such as between two manufacturers, or between a manufacturer and builder. The communication intent is for the additional usage of the results to be incorporated into a larger study in which the results of multiple studies are contributors to a larger scale analysis.

business-to-consumer (B2C): (See ISO 14025:2006¹), as aligned with ISO 21930:2017. Consumer is defined as an individual member or group representing the general public purchasing, using, or both, goods, property, or services. The communication intent is for the sharing of the results with the specifier, end user, or both, of the product and not intended to be aggregated into a larger study.

commissioned (declared unit): Product(s) produced under an agreement or order for a particular customer, project, or application, including customized, made-to-order, or project-specific items that have been installed or put into usage by end user(s) or customers. A functional unit that has been placed into service shall be considered the same as a declared unit.

display shelf: A shelf with a sloping surface and retaining flange or edge and that all shelving has a capacity calculated with a height of no more than 0.3048 m (12 in.).

hazardous waste: Waste identified as hazardous according to regulations applicable in the market for which the EPD is valid. For the US market, wastes are hazardous if they are regulated under the Resource Conservation and Recovery Act,¹⁵ see also 40 CFR 261.33.¹⁶ For the Canadian market, wastes are hazardous if they are regulated under the Canadian Environmental Protection Act, 1999 Regulations.¹⁷

Note. For guidance on radioactive waste, see ISO 21930:2017 Clause 7.2.14, *Environmental information describing waste categories and output flows*.

industry-average EPD: EPD results for a specific product or group of table products categorized by performance for a specified region and or group of manufacturers.

¹² US Department of Energy, Office of Energy and Efficiency and Renewable Energy, Life Cycle Indicators Database. 901 D Street, SW, Suite 930, Washington, DC 20024. <nrel.gov/lci>

¹³ World Business Council for Sustainable Development. Avenue du Bouchet 2bis, 1209 Geneva, Switzerland. <wbcsd.org>

¹⁴ World Resources Institute, 10 G Street, NE Suite 800, Washington, DC 20002. <ghgprotocol.org/sites/default/files/standards/Product-Life-Cycle-Accounting-Reporting-Standard_041613.pdf>

¹⁵ US EPA, Office of Resource Conservation and Recovery. 1200 Pennsylvania Avenue NW, Washington, DC 20004. <epa.gov/rcra>

¹⁶ Code of Federal Regulations, Office of the Federal Register, National Archives and Records Administration. 7 G Street NW, Suite A-734, Washington, DC 20401. <ecfr.gov>

¹⁷ <canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/canadian-environmental-protection-act-1999.html>

net consumables: Items used during manufacturing, such as lubricants, grease and oils.

non-hazardous waste: Commercial/industrial waste that is not hazardous.

Note. For guidance on radioactive waste, see ISO 21930:2017 Clause 7.2.14, *Environmental information describing waste categories and output flows*.

permanently installed: Bolted, or otherwise effectively fixed so that it cannot be removed without the use of tools or equipment, to a foundation or an alternative location in a building, structure, facility, or installation.

product-specific EPD: EPD results for a specific product or group of storage products, categorized by performance and developed by a manufacturer for a specific production facility location(s).

4 Abbreviated terms

Per ISO 21930:2017¹ Clause 4, with the following additions:

ACLCA	American Center for Life Cycle Assessment
AF&PA	American Forest & Paper Association
AMD	amendment
ANSI	American National Standards Institute
AP	acidification potential
B2B	business-to-business
B2C	business-to-consumer
BIFMA	Business + Institutional Furniture Manufacturers Association
CEN	European Committee for Standardization
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CML	Leiden University Institute of Environmental Sciences
DOT	Department of Transportation
DQA	Data Quality Assessment
EC	European Commission
eGRID	Emissions & Generation Resource Integrated Database
EN	European Norm
EP	eutrophication potential
EPA	Environmental Protection Agency
EPD	Environmental Product Declaration
FTC	Federal Trade Commission
GWP	global warming potential
ILCD	International Life Cycle Data System
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
JRC-IES	Joint Research Centre, Institute for Environment and Sustainability
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory

LCIA	Life Cycle Impact Assessment
LEED	Leadership in Energy and Environmental Design
LHV	lower heating value
MDF	medium density fiberboard
MSW	municipal solid waste
NERC	Northeast Recycling Council
NIST	National Institute of Standards and Technology
PCR	Product Category Rule
POCP	photochemical oxidant creation potential
REC	renewable energy certificate
RITA	Research and Innovative Technology Administration
SCTG	standard classification transportable goods
SVHC	substances of very high concern
TRACI	Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts
UN	United Nations
US	United States
USGBC	US Green Building Council
WARM	Waste Reduction Model
WMO	World Meteorological Organization
WRI	World Resources Institute

5 General aspects

5.1 Objectives of this PCR

Per ISO 21930:2017¹ Clause 5.1, with the following additions.

The goal of this PCR is to specify the guidelines for developing an ISO 14025:2006¹ conformant Type III EPD, based on an ISO 14040:2006/AMD 1:2020¹ and ISO 14044:2006/AMD 1:2017/AMD 2:2022¹ conformant LCA. The goal of an LCA that conforms to this PCR shall be, at a minimum, to calculate the environmental impacts of each life cycle stage of the product for select indicators and shall be presented in such a way as to present the life cycle environmental impacts to the public. The scope of the LCA shall conform to the ISO 14040 series (ISO 14044:2006/AMD 1:2017/AMD 2:2022 Clause 4.2.3.1) and meet the requirements given in Section 5.2.

This PCR was not written to support comparative assertions between products of different manufacturing organizations. EPDs based on different PCRs or different calculation models may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the variability in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study and the software tool used to conduct the study.

Users of this PCR shall include a statement in their EPD as follows:

"The PCR this EPD was based on was written to determine the potential environmental impacts of a storage product from cradle-to-gate with options. It was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of

the uncertainty in the final results, due to and not limited to the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled."

5.2 Life cycle stages

Per ISO 21930:2017¹ Clause 5.2, with the following clarifications and addendums.

This PCR and subsequent EPDs shall include modules A1-A3, B1-B5, C1-C4, and optionally A4-A5 and D. Modules B6-B7 are not declared, as shown in Table 1.

Required modules for EPDs covered by this PCR are illustrated in Table 1.

Table 1
Description of the system boundary module

Production stage			Construction stage		Use stage							End of life stage				Benefits and loads beyond the system boundary
Raw material extraction	Transport	Manufacturing	Transportation to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operation energy use	Operation water use	De-construction	Transport	Waste processing	Disposal	Reuse/recycle
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	O	O	X	X	X	X	X	MND	MND	X	X	X	X	O

MND = module not declared, X = module declared, O = optional declaration

5.3 Average EPDs for groups of similar products

Per ISO 21930:2017¹ Clause 5.3, with the following clarifications and additions.

Based on multiple proprietary LCAs and one publicly available LCA¹⁸ from furniture industry manufacturers, similar product configurations, options, or both (i.e. products available with different textiles, core construction material (metal, wood, composite), surface treatments, number of drawers/shelves, etc.), or both may be included in the same declaration, provided that the range of variation within each impact category does not exceed $\pm 10\%$ of impact categories listed in Section 9. The LCA report may include multiple configurations (material and process inventories) that differ from each other by more than 10% in one or more impact categories for the purposes of assessment; however, a base configuration shall be chosen for LCA and those configurations (textiles, materials, surface treatments, etc.) that are within the 10% threshold may be indicated

¹⁸ Dietz, Bernhard. *Life cycle assessment of office furniture products*, 2005. <css.umich.edu/publications/research-publications/life-cycle-assessment-office-furniture-products>

in the EPD as being representative by the base configuration. Alternative configurations with greater than 10% change in one or more impact categories may be reported within the EPD as such, alternatives. The base configuration and its corresponding environmental impacts shall be clearly identified in the EPD. Where alternative configurations are also included, the goal and scope of the study shall clearly identify them as alternate configurations in the EPD, and the results presented as ranges for each impact category reported. For example, the base configuration could be the highest selling configuration or average impact configuration, and alternative configurations could then be assessed to reflect maximum or minimum impacts, or both, to environmental categories. The following requirements shall be applied when including a range or group of similar products:

- All materials included in the base product configuration must be clearly identified. Any materials considered sufficiently equivalent should be explicitly stated. To qualify as sufficiently equivalent, a material must meet at least one of the following criteria, ensuring no significant or noticeable impact on the environmental effects compared to the original material:
 - **textiles:** Any variation in color will be considered sufficiently equivalent, as long as the base construction and configuration of the textile remain unchanged. For example, for a textile made from 100% recycled polyester with no additional treatments or backing, all color variations will be represented by the selected example textile in the model.
 - **paints, finishes and powder coats:** Any variation in color will be considered sufficiently equivalent, as long as the base construction and configuration of the paint, finish, or powder coat remain unchanged. For example, for an epoxy-based powder coat, all color variations will be represented by the selected example powder coat in the model.
 - **natural wood:** Any variation in species will be considered sufficiently equivalent and the selected species will used in the model shall be representative of all other species of wood. For example, if maple is selected in the model, that shall equally cover birch species.
 - **laminates:** Any variation in color will be considered sufficiently equivalent, as long as the base construction and configuration of the laminate remain unchanged. For example, for a laminate in the color honey maple, all color variations will be represented by the selected example laminate in the model.
- Description of what the product or range of products represents. The range of products shall comply with the requirements as defined in Section [7.1.3](#). Additional options can be included and presented as additions to the impacts of the base configuration:
 - For example: Base configuration is a solid wood file cabinet; options could include integrated slow close drawer slide or lift lid once drawer is pulled out. The study would be based upon appropriate data from manufacturers for a base solid wood file cabinet and thus the results presented for the industry average would be for the base configuration. The impacts of the options would be presented as “adders” to the environmental impacts of the base configuration, thus allowing for clarity of impacts associated with the options added to the base product configuration. The adder(s) would be presented separately from the base configuration allowing for each adders’ impacts to be reflective of just the adder(s). Adders shall be grouped by similar type and assessed, with results reported separately for each type of adder.

5.3.1 Industry-average EPDs

An industry-based average EPD may be developed, provided the following conditions are met:

- the study shall consist of data contributions of no less than fifty percent (50%) of the manufacturers (by brand name) of product(s) within the range of product(s) of the study including potential ranges that are of the same justification.

- the scope of production is specified to a specific region, i.e. North America, Europe, Asia, etc.
- all data conforms to the requirements of this PCR.
- description of what the product or range of products represents. The range of products shall comply with the requirements as defined in Section [7.1.3](#). Additional options can be included and presented as additions to the impacts of the base configuration:
 - For example: Base configuration is a solid wood file cabinet; options could include integrated slow close drawer slide or lift lid once drawer is pulled out. The study would be based upon appropriate data from manufacturers for a base solid wood file cabinet and thus the results presented for the industry average would be for the base configuration. If adder(s) are to be included in the study, then contributing manufacturers shall include the same adder(s) as part of the base configuration of the study. There shall be no separate adder(s) presented with the study nor included in the industry-average EPDs that have not already been included in the base configuration as stated above.
- the summary report shall document results due to the modeling parameters, including:
 - assessment tool, reference year, and level of assumptions
 - allocation approach(es) that were applied to any specific data collected for the purpose of creating the EPD.

5.4 Use of EPDs for construction products

Per ISO 21930:2017¹ Clause 5.4, with the following clarifications and additions.

This PCR is intended to be used to create EPDs for use in B2B and B2C communication.

5.5 Comparability of EPDs for construction products

Per ISO 21930:2017¹ Clause 5.5, with the following clarifications.

This EPD shall conform to the requirements of this PCR and was not written to support comparative assertions. EPDs based on different PCRs or different calculation models may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results due to and not limited to the practitioner's assumptions, the source of the data used in the study, and the software tool used to conduct the study. See Section [5.1](#) for required statement for inclusion in EPD.

To minimize uncertainty, LCI data sources shall be consistent between the manufacturer-specific EPD and the industry-average benchmark EPD as follows:

- background life cycle inventory data sets and reference year:
 - Where a manufacturer-specific EPD is developed using the same LCI dataset(s) and version as the industry-average, comparison may proceed (no recalculation is necessary).
 - Where a manufacturer-specific EPD is developed using LCI dataset(s) and version that differs from dataset(s) and version used in the industry-average, and the results are different, the industry-average EPD results shall be recalculated using the LCI dataset(s) used for manufacturer-specific EPD.

- priority of primary and secondary data sources
- specific primary, non-life cycle inventory data (e.g. transportation distances and modes).

5.6 Documentation

Per ISO 21930:2017¹ Clause 5.6.

6 PCR development and use

Per ISO 21930:2017¹ Clause 6, with the following additions.

This PCR document is effective for 5 yr from the latest date of publication. If after 5 yr, relevant changes in the product category or other relevant factors have occurred (for example, evolution of LCA methodology in ISO 21930:2017), the document should be revised. See Section [5.5](#) for comparability.

7 PCR for LCA

7.1 Methodological framework

7.1.1 LCA modeling and calculation

Per ISO 21930:2017¹ Clause 7.1.1.

7.1.1.1 Electricity modeling

Electrical energy data shall use NERC regions, or eGRID regions, or similar data to represent electrical energy production for the US and Canada, and shall be declared. Preference shall be given to datasets that include transmission and distribution losses. For regions other than the US and Canada, country or region-specific processes shall be used for the manufacturing stage provided they are representative. The sources for electricity and the calculation procedure shall be documented.

Where primary data are available for the electrical power grid for a given unit process, it shall be used to model the electricity source. If data are not available at that level, the next highest aggregation of electrical grid data¹⁹ shall be used, with a preference of local, regional, national, and then multi-national.

Carbon offsets shall not be used in the inventory. These refer to credits purchased for processes not under the control of the purchaser. For example, a coal-fired power plant might buy carbon credits that support the planting of forests.

On-site renewable energy from solar cells or other renewable energy sources may only be included in the inventory if the RECs (green power attributes or equivalent) are not transferred to another party. This process avoids the issue of double-counting renewable energy inputs. The intent is to only include energy grid offsets that are directly connected to the manufacturing process tied to production of the product.

RECs, PPAs, EACs shall not be used in the inventory, but may be disclosed as disclosed in Section [8.3](#), and not part of the inventory directly connected and have no impact to the assessment. These certificates represent

¹⁹ One recommended source for residual mix factors is Green-e: green-e.org/2023-residual-mix

legal property rights to the “renewable-ness” or non-power (i.e. environmental) attributes of renewable electricity generation.²⁰

7.1.1.2 LCIA methodology

Impacts shall be calculated and reported per declared unit for each life cycle stage aligning with Table 1 and shall be disclosed as detailed in Section 7.3.

7.1.1.3 Sensitivity analysis

Sensitivity analyses shall be performed when allocation is used (on processes owned and controlled by the reporting company) and it is not related to mass or energy flows, or if capital goods, infrastructure, and personnel-related impacts are included in the measurement. If primary data is used from more than one location to determine unit processes, justification of data used shall be provided. If proxy data representing more than 5% of the mass or energy of the system is used, justification of data used shall be provided.

7.1.2 Functional unit

Per ISO 21930:2017,¹ Clause 7.1.2 shall only be used for reporting the functional unit on a per one cubic meter (1 m³) of storage capacity in which the product offers. In addition, a statement shall be included in the EPD that declared unit is equivalent to the functional unit of storage for this PCR once the product has been commissioned.

7.1.3 Declared unit

Per ISO 21930:2017¹ Clause 7.1.3, with the following clarifications.

The declared unit shall be one unit of storage with a designated representative volume maintained for a 10-yr period. The declared unit shall declare in the EPD the overall physical dimensions of the product. The declared unit shall be presented as how it applies to one of the sub-categories:

- Products that have been documented to meet ANSI/BIFMA X5.9⁴ can be considered to meet the 10-yr service life.
- For storage units with a service life of more than 10 yr, the entire impact shall be allocated to the 10-yr period (i.e. the reference flow shall be one storage unit and not a portion of a storage unit, and results shall not be normalized from a fraction of a storage unit to meet the declared unit).
- Storage products that will not last for 10 yr or have a warranty period less than 10 yr, or both, shall include the number of units necessary to meet the 10-yr period (for example, a table product with a 5-yr warranty shall require 2 units of product to meet the declared unit requirements). No fractional units shall be allowed; rounding up to the whole unit shall be required.

The EPD shall provide information for the entire physical product. The total storage capacity of the product in cubic meters, as calculated below, shall be clearly stated on the front page of the EPD declaration and unit values shall not be less than zero. The product or range of products shall denote which sub-category of storage function that the unit represents and shall disclose the capacity of storage in m³. Additional information may include the product(s) weight, volume, and required square meter of floor space to support the products full range of functions. In order for a volume of the storage device to be included, it shall have a bottom supporting structure included in the product configuration. For example, a set on device, hutch, with no bottom panel, yet with shelving included, shall only include the shelving in the capacity calculations. The

²⁰ See the EPA publication, *Offsets and RECs: What's the Difference?* at <[epa.gov/sites/default/files/2018-03/documents/gpp_guide_recs_offsets.pdf](https://www.epa.gov/sites/default/files/2018-03/documents/gpp_guide_recs_offsets.pdf)>.

calculation for capacity of storage shall align with the ANSI/BIFMA X5.9 (current version) definitions found in Section 2.5 and 2.6 referenced below:

"2.5 clear dimensions: The clear dimensions of the extendible element or storage component are defined by the sides of the largest rectilinear box that fits into the space. For extendible elements, the box must clear all stationary elements as the extendible element is taken through its full range of travel.

2.5.1 clear depth: The horizontal dimension of the box in the front-to-back direction. The clear depth is not reduced by the presence of a compressor, (a device used to restrict the movement of the filed material).

2.5.2 clear height: The vertical dimension of the box.

2.5.3 clear width: The horizontal dimension of the box at right angles to direction of travel.

2.6 clear space: The volume defined by the product of the clear dimensions, e.g. clear space = clear depth × clear width × clear height."

Option A: Open static storage (e.g. bookcases, hutches, towers, etc.)

A storage device that is stationary and consists of no moving parts. The storage device may contain parts that may be repositioned, (e.g. shelf or divider panel). The storage device shall allow for convenient storage of articles including, but not limited to: books, binders, personal and non-personal items found or used in the space, or both. Storage space is maximized by utilizing vertical space. A declared unit for this category contains 0.15 m³ of storage capacity, or greater.



Storage capacity calculations (example)

Storage opening size	
depth (m)	0.3
width (m)	0.5
height (m)	0.25
volume (m³)	0.0375
# of openings	4
total volume (m³)	0.15

Option B: Closed static storage (e.g. use of doors, sliding or hinged, or both)

A storage device that is stationary and consists of moving parts. Moving parts may include doors, lids, caps, or covers, or any combination, that may be attached by use of hinges or track guides for sliding. The storage device may contain parts that may be repositioned, (e.g. shelf or divider panel). The storage device shall allow for convenient storage of articles, including but not limited to the following: books, binders, personal and non-personal items found or used in the space, or both. Storage space is maximized by utilizing vertical space.

**Storage capacity calculations (example)**

Storage opening size	Large	Small
depth (m)	0.333	0.333
width (m)	0.3	0.15
height (m)	0.25	0.25
volume (m ³)	0.025	0.0125
# of openings	4	4
total volume (m ³)	0.10	0.05

Option C: Storage device with retractable storage areas: (e.g. file cabinets, pedestals, lateral files, cabinets, etc.)

A storage device that has one or more drawers that extend, and has the intended purpose of facilitating the storage of legal and letter size files or other personal or office related products and materials. Additional functions shall be clearly denoted in the Product Description section of the EPD. A declared unit for this category typically contains 0.15 m³ of storage capacity, or greater.

**Storage capacity calculations (example)**

Drawer capacity size	
depth (m)	0.2755
width (m)	0.65
height (m)	0.2755
volume (m ³)	0.049
# of openings	3
total volume (m ³)	0.15

Option D: Mobile storage: (e.g. has wheels or casters for movement)

A storage device that is mobile by way of permanently installed mobility equipment such as wheels or casters. Note that glides (circular, usually metal buttons attached to the bottom of furniture) shall not be considered a method of mobility for a storage device. The storage device may consist of moving parts. Moving parts may include doors, lids, caps, or covers, or any combination, that may be attached by use of hinges or track guides for sliding. The storage device may contain parts that may be repositioned, (e.g. shelf or divider panel). The storage device shall allow for convenient storage of articles including, but not limited to: books, binders, personal and non-personal items found or used in the space, or any combination thereof. Storage space is maximized by utilizing vertical space. A declared unit for this category typically contains 0.05 m³ of storage capacity, or greater.

**Storage capacity calculations (example)****Drawer capacity size**

depth (m)	0.441
width (m)	0.31
height (m)	0.28
volume (m ³)	0.038
# of openings	2
total volume (m ³)	0.075

Option E: Wall-mounted storage

A storage device that is stationary and requires usage of a vertical structure for attachment and functional support. The storage device may be flat or angled (e.g. shelf, display shelf) and may contain sides, back, or top panels. Storage space is maximized by utilizing vertical space. A declared unit for this category typically contain 0.05 m³ of storage capacity, or greater. In the event that storage device is flat and has no side walls, storage capacity shall be calculated using the default height of 0.3048 m.

**Storage capacity calculations (example)****Display shelf capacity**

depth (m)	0.274
width (m)	0.60
height of opening or side walls (m)	0.3048
volume (m ³)	0.050
# of openings	1
total volume (m ³)	0.050

Option F: Non-existing classification, or combination thereof

A storage device that meets more than one category above, or does not conform to the specific requirements of Options A through E above, or for a storage product type that did not exist at the time of writing this PCR. The storage device within this grouping shall be a clearly defined declared unit that conforms to the requirements of this PCR and complies with the capacity defined in this sub-section. The function(s) of general storage includes some combination of storage characteristics described in Options A through E that provide storage for a variety of office and personal items within the space, stored items such as paper, binders, books, office supplies, coats, and personal items. A declared unit for this category typically contain 0.25 m³ of storage capacity, or greater. Capacity calculations shall be done as exemplified above and cumulated as appropriate based upon storage type.

Example: Open and closed storage with doors and retractable devices.

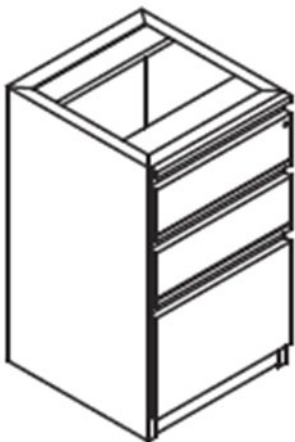


7.1.3.1 Materials composition

The illustration below shows an example of the representative product specifications and shall be shown as part of the LCA and EPD: consisting of material composition of the reference product, in kg per declared unit, percentage of total weight, and recycled content. Source of recycled content shall be clearly documented in the LCA study.

Illustration 1

Reference examples of basic storage arrangement showing materials and percentage weight of final product



Material	Material weight [kg]	Percent of product [%]	Post-consumer		Pre-consumer	
			Weight [kg]	%	Weight [kg]	%
aluminum	0.365	1.6%	0.1095	30	0	0
plastic	0.27	1.2%	0	0	0.0804	30
steel	11.56	51.3%	2.89	25	0	0
brass	0.02	0.10%	0	0	0	0
powdercoat	0.33	1.5%	0	0	0	0
concrete	10.00	44.4%	0	0	0	0
TOTAL	22.55	100.0%	3.00	—	0.08	—

7.1.3.2 Life cycle inventory data

The following inventory categories shall be reported (e.g. energy and water) in total:

- Net freshwater consumption (m³) (The EPD shall indicate if water usage from electricity generation is not included.)

Note. 0.001 m³ of water is equal to 1 L of water.

- Primary energy demand in total, respectively (renewable and non-renewable energy) (MJ)

7.1.3.3 Impact assessment categories

Impact categories shall use the characterization models specified in Section [7.1.1.2](#).

7.1.4 Reference service life

Per ISO 21930:2017¹ Clause 7.1.4, with the following clarifications.

The ANSI/BIFMA X5.9⁴ method is an industry-recognized and approved test methodology demonstrating that a storage products unit remain usable for a period of 10 yr. Products that have been documented to meet ANSI/BIFMA X5.9 can be also considered to meet the 10-yr service life. The 10-yr service life was based upon an extensive study conducted on behalf of BIFMA, in which various product types were evaluated for typical service life in their original application, prior to replacement due to various reasons, including updates to facility and the need for general replacement.

For storage with a service life of more than 10 yr, the entire impact shall be allocated to the 10-yr period (i.e. the reference flow shall be one chair and not a portion of a chair and results shall not be normalized from a fraction of a chair to meet the declared unit). The full impacts from cradle-to-gate with options shall be included in the total environmental impacts of the product(s) required.

If the product does not meet ANSI/BIFMA X5.9 or equivalent, and the warranty period is 5 yr or more, the maximum service life shall be 5 yr. For products with warranties less than 5 yr, the service life shall equal the warranty period.

Note. For questions regarding equivalency, please contact ncss@nsf.org.

7.1.5 System boundary with nature

Per ISO 21930:2017¹ Clause 7.1.5.

System boundaries are a set of criteria specifying which unit processes are part of a product system. The life cycle of cradle-to-gate with options shall include Production (A1-A3), Use modules (B1-B5), End-of-Life (C1-C4); and optionally Construction (A4-A5), and supplementary information beyond the system boundary module D; modules B6-B7 are not declared. Rules on how recycling processes should be handled are described in detail in Section [7.2](#).

Production of capital goods, infrastructure, and personnel-related activities shall not be included. The underlying LCA report shall detail the system boundaries and include a description of the life cycle modules for the product under study.

7.1.6 System boundary between products systems

Per ISO 21930:2017¹ Clause 7.1.6.

7.1.7 System boundaries and technical information for scenarios

Per ISO 21930:2017¹ Clause 7.1.7.

7.1.7.1 General

Per ISO 21930:2017¹ Clause 7.1.7.1.

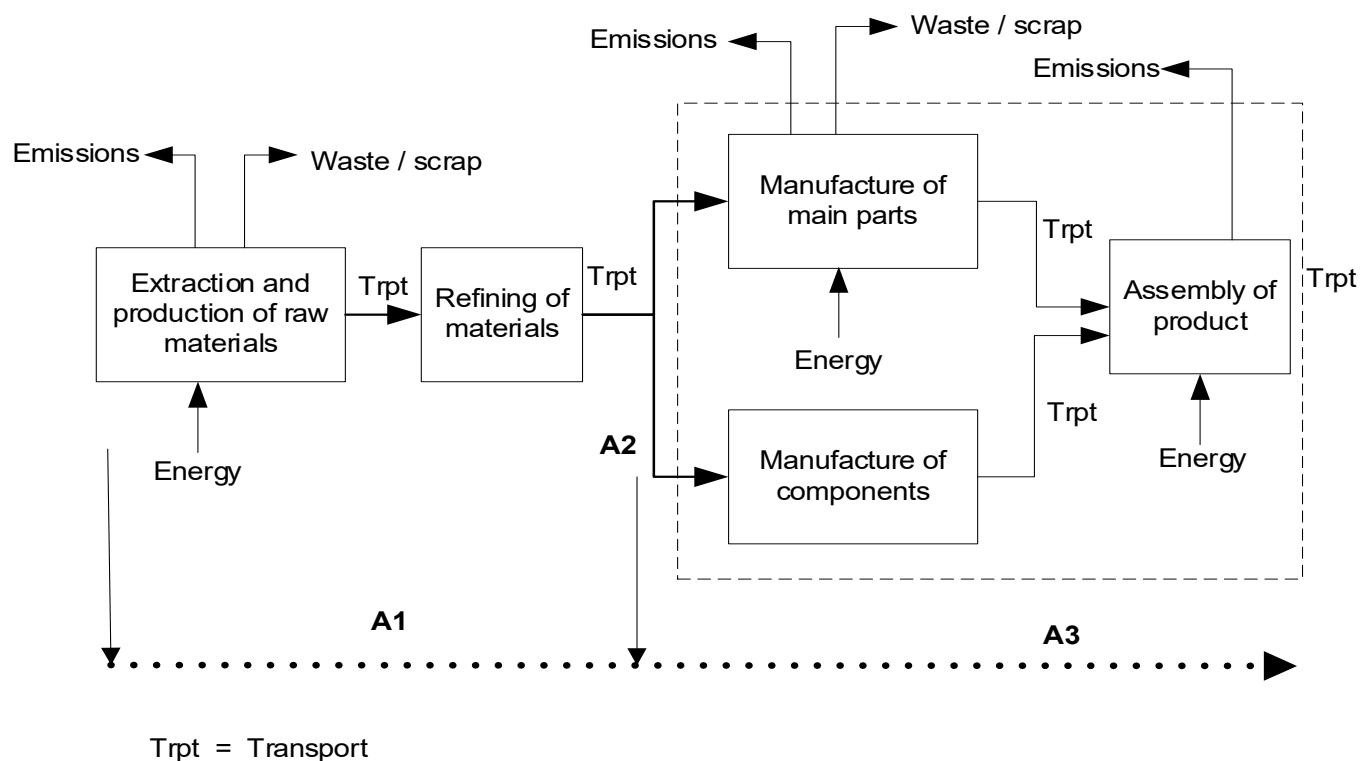
7.1.7.2 A1 to A3, production stage

Per ISO 21930:2017¹ Clause 7.1.7.2, with the following clarification.

Below is illustration of A1-A3 as applicable to this PCR.

Illustration 2

Example flow for illustrative purposes only



7.1.7.2.1 General

Per ISO 21930:2017¹ Clause 7.1.7.2.1.

7.1.7.2.2 A1, extraction and upstream production

Per ISO 21930:2017¹ Clause 7.1.7.2.2, with the following clarification.

Materials and the related processing can be considered either “primary” or “secondary”:

- Primary materials are extracted from nature, examples include iron ore, bauxite, wood, etc. that are used to create basic materials used in the production of office furniture (e.g. steel).
- Secondary materials are recovered, reclaimed, or recycled content that are used to create basic materials to be used in the production of office furniture. Transportation of materials shall be included in the life cycle impact assessment.
- Primary processing is the conversion of materials to a bulk form or a generic shape (materials or components that are not necessarily manufactured exclusively for the office furniture industry).
- Intermediate processing is the conversion of materials to components (e.g. particleboard, plastic pellets, steel coil, etc.).

In practice, many materials can be combinations of both primary and secondary materials.

7.1.7.2.3 A2, transport to factory

Per ISO 21930:2017¹ Clause 7.1.7.2.3, with the additional clarification:

Primary data for raw material transport materials, including recycled or secondary materials, or both, shall be used. If primary data are not available, generic data may be used with documented justification.

Transportation to the processing plant shall include empty backhauls and transportation to interim distribution centers or terminals. Data sources for backhauls shall be cited, e.g. US Life Cycle Inventory Database¹² or alternatively, methods used to account for empty backhauls shall be described.

All transportation, including interfacility transport, prior to the material being shipped to the production stage shall be included.

Transport from extraction and upstream production to the factory shall be included. If using a life cycle inventory unit process where this transport data are not included, or primary data do not exist, transport distances for all three modes listed in Table 2 shall be used for North American based processes. Transport of the extracted raw materials within extraction and upstream production is not covered in Table 1 but shall be included. For processes outside of North America, an appropriate regional or national transportation distance and mode(s) shall be used where primary data do not exist. A weighted average transportation distance may also be calculated from primary data. Table 2 below is intended to be used for material transportation associated with the appropriate process flow(s). If more than one transportation mode was required, then the usage of multiple transportation data sets shall be reflected in the LCA. Where the table shows values for transport for rail, truck and ship, all values shown in the appropriate row shall be used, if using the table. For instance, veneer is shown to travel by truck, rail and ship to reach the manufacturer.

Table 2

North American default material transport distances, for extraction and upstream processes to North American manufacturing

Raw material/ Classification grouping		Distance (miles)		
		Rail	Truck ^a	Water
veneer	26 wood products	162 mi (206 km)	332 mi (504 km)	5,982 mi (9,627 km) Picking five ports for an average of all water transport (Asia, Australia, Africa, Europe, and South America)
particle board	26 wood products	162 mi (206 km)	332 mi (504 km)	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)
MDF	26 wood products	162 mi (206 km)	332 mi (504 km)	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)
paper backer	27 pulp, newsprint, paper, and paperboard	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge) 837 mi (1,347 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7)	742 mi (1,194 km)	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)
solid wood	26 wood products	162 mi (206 km)	332 mi (504 km)	5,982 mi (9,627 km) Picking five ports for an average of all water transport (Asia, Australia, Africa, Europe, and South America)
plywood	26 wood products	162 mi (206 km)	332 mi (504 km)	5,982 mi (9,627 km) Picking five ports for an average of all water transport (Asia, Australia, Africa, Europe, and South America)

Table 2

North American default material transport distances, for extraction and upstream processes to North American manufacturing

Raw material/ Classification grouping		Distance (miles)		
		Rail	Truck ^a	Water
plastic (inc. polymer-based materials; exc. textiles)	24 plastics and rubber	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)	757 mi (1,218 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 13	960 mi (1,544 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7
steel	32 base metal in primary or semifinished forms and in finished basic shapes	562 mi (904 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7	932 mi (932 km)	833 mi (1,340 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7
extruded aluminum	32 base metal in primary or semifinished forms and in finished basic shapes	562 mi (904 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7	932 mi (932 km)	833 mi (1,340 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7
cast aluminum	32 base metal in primary or semifinished forms and in finished basic shapes	562 mi (904 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7	932 mi (932 km)	833 mi (1,340 km) in 2007 US DOT Shipment Characteristics by SCTG Code Table 7
glass	31 non-metallic mineral products	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)	126 mi (202 km)	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)
fabric leather	30 textiles, leather, and articles of textiles or leather	0 mi (NA due to this mode of transport not being significant for this commodity, to our knowledge)	294 mi (473 km)	5,982 mi (9,627 km) Picking five ports for an average of all water transport (Asia, Australia, Africa, Europe and South America)
other ^b	This includes all other non-specified material (fiberglass, organics, etc.)	208 mi (334 km)	531 mi (854 km)	2,282 mi (2,672 km)

Table 2

North American default material transport distances, for extraction and upstream processes to North American manufacturing

Raw material/ Classification grouping	Distance (miles)		
	Rail	Truck ^a	Water

Note 1. NA: Not applicable, SCTG: Standard classification transportable goods.

Note 2. The average transport distances could also be used for complete components or units.

Note 3. Oceanic distances were approximated. For materials where a particular mode of transport was not typical or common, it was assumed to be zero.

Note 4. Table 7 and Table 13 as referenced from: <bts.gov/archive/publications/commodity_flow_survey/classification>

Note 5. Distances taken from the US Department of Transportation RITA website "TranStats."

^a Truck distance listed in round trip, as the assumption is made that the delivery truck returns empty after making the delivery.

^b Distances are based upon the average of all other material categories and shall be used in absence of primary data.

7.1.7.2.4 A3, manufacturing

Per ISO 21930:2024¹ Clause 7.1.7.2.4, with the following clarification.

This module describes the product boundary encompassing the fabrication and assembly of business and institutional furniture. For the purposes of this PCR, manufacturing begins at the receiving dock of the first facility where basic materials used in the manufacture of the furniture (e.g. steel, particleboard, fabric, laminate, etc.) begin the conversion to furniture components. Manufacturing ends at the shipping dock where the ready-to-install furniture will be transported for distribution to the end user. During manufacturing, the product undergoes the transformation from intermediate materials, to product component, to semi-finished product, to the final product; additionally, any co-products or wastes formed during manufacturing shall be disclosed in this module.

Transportation of parts, semi-finished and finished products, to the place of final assembly or distribution, or both, shall be included. Intercompany movement of parts, semi-finished, and finished products shall be accounted for where facilities fall under operational control of the reporting company. For facilities not under operational control of the reporting company, intercompany movement of goods should be included.

7.1.7.2.5 Input of secondary materials or recovered energy

Per ISO 21930:2017¹ Clause 7.1.7.2.5.

7.1.7.2.6 Co-products leaving the system

Per ISO 21930:2017¹ Clause 7.1.7.2.6.

7.1.7.2.7 Output of waste

Per ISO 21930:2017¹ Clause 7.1.7.2.7, with the following clarification.

Waste and scrap created during production shall be included in the LCA model. Commercially available LCA software programs typically embed these flows in the modeling datasets. Primary data shall be used if these are available. If waste materials are recycled, landfilled, combusted, or composted, the transport distances shall follow the current version of the US EPA WARM Model¹¹ unless primary data are used, the default distance of 20 mi (32 km).

The amount of waste material sent to landfill versus recycling, shall be based on EPA *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures*⁹ (current version) within North America, or other appropriate regionally or nationally applicable model for production outside of North America.

7.1.7.2.8 End-of-life scenarios for packaging

Per ISO 21930:2017¹ Clause 7.1.7.2.8.

7.1.7.3 A4 to A5, construction stage (optional)

7.1.7.3.1 General

Per ISO 21930:2017¹ Clause 7.1.7.3.1.

7.1.7.3.2 A4, Transport to construction site (optional)

Per ISO 21930:2017¹ Clause 7.1.7.3.2, with the following clarification.

This module shall, where applicable, include transport from the manufacturing gate to the construction site. The distance to the construction site may be estimated based on weighted average distance to the market of the product. When specific primary data is not available, the following scenario shall be used.

Distribution of product from the manufacturing gate to the construction site is assumed as 1,250 km by a single unit truck with an empty backhaul.

Any exceptions to this scenario shall be justified in the LCA report and noted in the EPD.

The default water and energy consumption installation scenarios for product(s) shall be assumed according to Table 3. Any exceptions to these scenarios shall be justified in the LCA report and noted in the EPD. Product(s) shall assume and report water and fuel consumption.

The values provided for gasoline, diesel, and electricity are based on a weighted market share for each energy source.

7.1.7.3.3 A5, Installation (optional)

Per ISO 21930:2017¹ Clause 7.1.7.3.3, with the following clarification.

Module A5 shall, where applicable, account for upstream emissions associated with fuel and electricity production and on-site combustion emissions from the fuel sources.

The default water and energy consumption installation scenarios for product(s) shall be assumed according to Table 3. Any exceptions to these scenarios shall be justified in the LCA report and noted in the EPD. Product(s) shall assume and report water and fuel consumption.

The values provided for gasoline, diesel, and electricity are based on a weighted market share for each energy source.

Table 3**Water and energy installation scenarios for product categories**

Product category	Product Category	Water (m ³)	Gasoline (MJ, LHV)	Diesel (MJ, LHV)	Electricity (kWh)
Storage	All	0	0	0	0.625

Note. Sub-categories are assumed to be one product unless noted otherwise. All values were developed by the PCR committee participants.

7.1.7.3.4 End-of-life scenarios for packaging

Per ISO 21930:2017¹ Clause 7.1.7.3.4, with the following clarification.

The amount of each material in the packaging or product that can be assumed to be recycled is determined by multiplying the EPA MSW⁹ within North America, or other appropriate regionally or nationally applicable model recycling rate (in %) by the amount of each homogenous material type that is able to be disassembled. The remaining materials that are not recycled should be modeled for end-of-life, using 80% landfill and 20% incineration.²¹

7.1.7.4 B1-B5 (B6-B7 are not declared), Use stage

Per ISO 21930:2017¹ Clause 7.1.7.4, with the exception of B6-B7, which are not declared.

EPDs for products under this PCR shall declare B1-B5, that have been assessed to have no activity associated with the Use stages and thus can be reported as zero, with the following exceptions to replacement and reporting general information pertaining to potential energy usage if operational features were used of the product.

If a product does not meet the 10-yr life requirements, then a replacement shall be included as part of the inventory and assessment.

The use stage includes the consumer taking possession of the product and ends with the used product entering the end-of-life stage. For some products, the use stage does not require energy or other natural resources nor generate emissions (e.g. greenhouse gases):

- storage at the use location
- assembly and installation of a product
- normal use
- replacement.

Repair and maintenance occurring during the usage time are excluded from scope of this PCR.

If product configuration included electrical componentry as part of the inventory, there shall be no use phase associated with those components. As several scenarios could be developed, there are too many variables in terms of the amount of usage, electrical grid (internal and external), etc. and life expectancy validation to warrant use phase inclusion. In lieu of use phase assumptions associated with electrical components, the underlying LCA study and related EPD shall report energy usage requirements in kWh for 1 h of usage.

²¹ The usage of 80%/20% is a general disposition determined by the US EPA in *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks*, page 111, and is deemed to be an acceptable disposition rate of final materials.

7.1.7.5 C1 to C4, end-of-life-stage

Per ISO 21930:2017¹ Clause 7.1.7.5, with the following additions.

The end-of-life stage boundary begins when the used product is ready for disposal, recycling, reuse, etc. and ends when the product is landfilled, returned to nature or transformed to be recycled or reused. Processes that occur as a result of the disposal are also included within the end-of-life stage. End-of-life processes may include:

- collection of end-of-life products
- incineration and sorting of bottom ash
- landfilling, landfill maintenance, decomposition emissions.

Primary data on the actual end-of-life treatment for the product shall be used, if available. In the absence of primary data, the most current version of the following shall be used to determine the percent of each material in the product(s) that can be recycled versus landfilled:

- US EPA MSW⁹ data, or
- US EPA WARM model,¹¹ or
- surrogate (shall be identified in the EPD) within North America
- another appropriate regionally or nationally applicable model shall be used outside North America.

The amount of each material in the product that can be assumed to be recycled, is determined by multiplying the US EPA MSW within North America, or other appropriate regionally or nationally applicable model recycling rate (in %), by the amount of each homogenous material type that is able to be disassembled. The remaining materials that are not recycled, should be modeled for end-of-life, using 80% landfill and 20% incineration.²¹

7.1.7.6 Benefits and loads beyond the system boundary in optional supplementary Module D

Per ISO 21930:2017¹ Clause 7.1.7.6.

Although not a formal life cycle stage, if a product system has potential benefits outside of the system boundary such as from recycling, reuse, energy recovery, etc., it may be reported here. This does not include impacts from allocated co-products.

Typical processes that are considered in Module D are:

- energy recovery from incineration
- recycling efforts
- reuse of unused product (if applicable).

Documentation shall be provided to ensure these activities actually occur. Additionally, since Module D is not considered a life cycle stage, its results do not affect the overall/total LCIA metrics reported in the EPD, but instead shall be reported separately for purpose of transparency.

7.1.8 Criteria for the inclusion and exclusion of inputs and outputs

Per ISO 21930:2017¹ Clause 7.1.8.

All known mass and energy flows should be included. Any flows that are knowingly omitted, shall be justified and shall meet the criteria as follows: Any mass and energy flow within the product boundary, which consists of less than 1%, may be omitted. Cumulative omitted mass or energy flows shall not exceed 5%.

7.1.9 Selection of data and data quality requirements

Per ISO 21930:2017¹ Clause 7.1.9, with the following additions.

All data shall be accurate, complete, and representative of the manufacturing process, current technology and current measurement capability. All data shall meet the data quality requirements given in to ISO 14044:2006/AMD 1:2017/AMD 2:2022 Clause 4.2.3.6.¹ Selection of data shall be consistent with the requirements of ISO 21930 Section 7.1.9, with the following additions:

- Secondary data should always be used in the upstream phases (extraction, processing and production). Information from databases may be regarded as secondary data, if they fulfill one or more of the following requirements:
 - representative of the geographical area, i.e. data from the same country, or from areas with the same energy supply mix
 - technological equivalence
 - boundaries towards nature
 - boundaries towards technical systems shall be of best equivalence.
- If secondary data are not available, use of a specific proxy is allowed. The user shall document and justify the decision to use the specified proxy.

A data quality assessment shall be made for the system under study. All The data quality rating method shall comply with the level and criteria as denoted in EN15804²² Appendix E: "Schemes to be applied for data quality assessment of generic and specific data". The study may elect to use either method and that method shall be clearly denoted in the LCA study.

Credit shall not be applied to LCA baseline when "green" power certificates are used, but certificates may be reported in Section [8](#).

7.1.10 Units

Per ISO 21930:2017¹ Clause 7.1.10, with the following clarification:

SI units shall be used. Optionally, EPDs may provide both US imperial and metric units using the following conversion factors:

²² European Standards s.r.o. Krimicka 134, 318 00 Pilsen, Czech Republic. <en-standard.eu>

Convert from:	Convert to:	Multiply by:
cubic yard (yd ³)	cubic meter (m ³)	7.654 549 E-01
square foot (ft ²)	square meter (m ²)	9.290 304 E-02
foot (ft)	meter (m)	3.048 E-01
British Thermal Unit (BTU)	megajoule (MJ)	1.055 056 E-03
pound (lb)	kilogram (kg)	4.535 924 E-01

Source: NIST: <physics.nist.gov/Pubs/SP811/appenB9.html>

International System of Units (SI units) shall be used for both the LCA and the EPD. Quantities shall be represented with a maximum of three significant figures.

7.2 Inventory analysis

Per ISO 21930:2017¹ Clause 7.2, with additional guidance as follows.

Where possible, allocation should be avoided by dividing unit processes into two or more sub-processes (as specified in ISO 14044:2006/AMD 1:2017/AMD 2:2022 Clause 5.3.4: *Allocation*¹). The expansion of system boundaries to include the additional functions of co-products shall be avoided. If allocation cannot be avoided, the following hierarchy of allocation methods is preferred:

- mass, or other biophysical relationship
- economic value.

If different allocation options, beyond the default required by the PCR, a sensitivity analysis shall be initiated. These different allocation approaches and data sets shall be documented and declared in the EPD.

For allocation due to recycling, companies shall use the Recycled Content Method. The Recycled Content Method is also referred to as the cut-off method, and the 100-0 method. Allocation procedures for reuse and recycling discussed in ISO 14044:2006/AMD 1:2017/AMD 2:2022 (see Clause 4.3.4.3) shall be applied for recycling situations.

Primary data (site specific or representative secondary averages) should be used for unit processes that contribute to the majority of the mass and energy flows, or which have the most relevant environmental emissions (ISO 14044:2006 /AMD 1:2017/AMD 2:2022).

7.2.1 Primary data

Primary data shall be used for facilities and processes under operational control of the reporting company. Secondary data that is representative of other facilities or locations producing similar components and processes may be used for facility operations that contribute less than 10% of the total product output, when at least 50% of facility operations data are from a primary source. For example, if the reporting company has more than one facility producing similar or same components and products by similar or same processes and materials and is located within the same electrical grid and geographical location, then primary data from the facility producing more than 50% of the annual volume may be used as representative data for all facilities.

7.2.2 Secondary data

For facilities and processes outside of the operational control of the reporting company, secondary data may be used. For products that are manufactured wholly or largely outside of the reporting company control (e.g. contracted products or significant assemblies), primary data are highly encouraged; however, secondary data may be used in lieu of primary data. The reporting company shall use energy production data aligned with the region (region shall be used from most local and relevant source being from local power grid, state power grid, country sub-regional power grid, to least of, a national power grid) of manufacture, and shall document the unit processes; and describe how the secondary data are appropriately selected. Justification for the inability to obtain primary data shall be provided in this case.

7.3 Impact assessment indicators describing main environmental impacts derived from LCA

Per ISO 21930:2017¹ Clause 7.3.

The following methodologies shall be used regardless of the location of the manufacturer; other methodologies may be reported in addition to the requirements.

- **GWP (100 yr) [kg CO₂-eq.]:** IPCC⁶ (AR5 or most recent version)
 - Global warming potential shall be reported as follows:
 - Total (GWP-total)
 - Fossil (GWP-fossil)
 - Biogenic (GWP-biogenic)
 - Land use and land change (GWP-luluc).
 - Consideration for reporting short-term (20-yr horizon), in addition to 100-yr reporting, is encouraged.
- **AP [kg SO₂ eq.]:** TRACI 2.2¹⁰ for North America; EN 15804²² for Europe, or Hauschild and Wenzel²³ for international.
- **POCP ("smog") [kg O₃ eq.]:** TRACI 2.2 for North America; EN 15804 for Europe, or Goedkoop et al.²⁴ for international.
- **EP - freshwater [kg N eq.]:** TRACI 2.2 for North America; EN 15804 for Europe, or Heijungs et al.²⁵ for international.
- **EP - marine [kg N eq.]:** TRACI 2.2 for North America; EN 15804 for Europe, or Heijungs et al. for international.
- **ODP [kg CFC 11-eq.]:** TRACI 2.2 for North America; EN 15804 for Europe, or WMO²⁶ for international.

²³ Hauschild, M. Z., & Wenzel, H. (1998). Environmental assessment of products: Vol. 2. Scientific background. Chapman & Hall.

²⁴ Goedkoop, M. J., Heijungs, R., Huijbregts, M., De Schryver, A., Struijs, J., & Van Zelm, R. (2016). ReCiPe 2016: A harmonised life cycle impact assessment method at midpoint and endpoint level. National Institute for Public Health and the Environment (RIVM).

²⁵ Heijungs, R., et al. (1992). *Environmental life cycle assessment of products: Guide and backgrounds*. Centre of Environmental Science, Leiden University.

²⁶ World Meteorological Organization. 7bis, avenue de la Paix, CH-1211 Geneva 2, Switzerland. <wmo.int>

Where TRACI 2.2 is referenced, TRACI 2.2, or the latest TRACI methodology available, shall be used at the time of EPD creation, similarly for reference to CML 2001.²⁷

In addition to disclosure using the TRACI 2.2 and IPCC (AR5, or most recent) indicators, the equivalent indicators from other impact models such as CML or those in the *EC Product Environmental Footprint Guide*²⁸ (EF methodology, latest version) may also be disclosed. Optional LCIA can include, but is not limited to the following:

- human toxicity
- land usage
- ecotoxicity.

8 Additional environmental information

Per ISO 21930:2017¹ Clause 8, with the following clarification:

EPDs developed using this PCR should include, where relevant, additional information related to environmental issues, other than the environmental information derived from LCA, LCI, or information modules. This information shall be separated from the information described in ISO 14025:2006,¹ Clause 7.2.2. Identification of the significant environmental aspects should conform to ISO 14025:2006, Clauses 7.2.3 and 7.2.4.

8.1 General

Per ISO 21930:2017¹ Clause 8.1.

8.2 Additional LCIA related information not included in preset LCIA indicators

Per ISO 21930:2017¹ Clause 8.2, with the following additions.

An EPD may also report additional environmental impact metrics not covered in Section 7.3. This reporting may include impact categories that are still under development or have high levels of uncertainty that preclude international acceptance pending further development. Examples include:

- abiotic depletion potential for non-fossil mineral resources (ADP_{elements})
- land-use related impacts
- toxicological aspects.

When reporting such metrics, they shall be accompanied by the following statement:

"These three impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes."

²⁷ Leiden University Institute of Environmental Sciences (CML). PO Box 9500, 2300 RA Leiden, The Netherlands. <universiteitleiden.nl>

²⁸ European Commission, European Union. Charlemagne Building, Rue de la Loi 170, 1040 Brussels, Belgium. <eplca.jrc.ec.europa.eu/EnvironmentalFootprint.html>

In the absence of regulated SVHC, the following statement shall be applied:

"No substances of very high concern identified per the candidate list of Substances of Very High Concern for Authorisation of the European Chemicals Agency."

The functional unit shall also be reported in m³, in Section [9.6](#). Those results shall be preceded by the following statement:

"The following set of results are included here for ease of comparison with EPDs developed to a previous version of the PCR."

8.3 Additional environmental information not derived from or related to LCA

Per ISO 21930:2017¹ Clause 8.3, with the following modifications.

Other characteristics or properties of sustainability efforts of the manufacturer may be included in the section. If the owner of the EPD elects to reflect the use of RECs, PPAs, EACs or other Renewable Electricity Instruments, then those reports shall follow the methodology and requirements as defined by the ACLCA found in ACLCA PCR Open Standard v1.0, *Guidance for Quantifying Renewable Electricity Instruments in EPDs*, May 26, 2023,² with special attention to Section 3.1: *Reporting in environmental product declarations (EPD)*.

8.4 Mandatory additional environmental information

Per ISO 21930:2017¹ Clause 8.4.

Regulated substances shall be reported in the EPD along with the product material content.

9 Content of an EPD

9.1 General

Per ISO 21930:2017¹ Clause 9.1.

9.2 Declaration of general information

Per ISO 21930:2017¹ Clause 9.2, with the following clarification and additions.

The EPD shall provide information for the entire physical product, including but not limited to the overall dimensions of the product. The subcategory declared storage unit, functions and respective storage capacity of the product along with photo or visual image including additional features included in the study shall be clearly stated on the front page of the EPD declaration denoting the product or range of products.

9.2.1 Owner and verification information

Table [4](#) of general product and verification information shall be presented on the inside cover of the EPD.

Table 4
Demonstration of verification

Product name	
Manufacturer name and address	
Program operator	
General program instructions and version number	
Declaration number	
Reference PCR and version number	
EPD type and scope	
Defined declared unit	
Product's intended application and use	
Product RSL	
Markets of applicability	
Date of issue	
Period of validity	
Year of reported manufacturer primary data	
LCA software and version number	
LCI database and version number	
LCIA methodology and version number	
Overall data quality assessment score ^a	
The sub-category PCR review was conducted by:	
This declaration was independently verified in accordance with ISO 14025: 2006. ISO 21930:2017 serves as the core PCR. Sub-category PCR: NSF 1122-26: BIFMA Storage	
☐ Internal ☐ External	
This life cycle assessment was conducted in accordance with ISO 14044:2006/AMD 1:2007/AMD 2:2020 and the reference PCR by:	
This life cycle assessment was independently verified in accordance with ISO 14044:2006/AMD 1:2007/AMD 2:2020 and the reference PCR by:	
Explanatory material can be obtained from the following:	
^a Per methodology found in ACLCA <i>Assessing Data Quality of Background Life Cycle Inventory Datasets</i> , or alternatively may comply with the level and criteria as denoted in EN 15804 ²² Appendix E: "Schemes to be applied for data quality assessment of generic and specific data".	

9.2.2 Required statements

The EPD shall include the following statements:

- *"EPDs are only comparable if they comply with ISO 21930, this sub-category PCR, include all relevant information modules and are based on equivalent scenarios with respect to the construction works context."*
- *"Environmental declarations from different programs may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building or construction works level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only*

possible when all stages of the life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background datasets may lead to differences in the results upstream or downstream of the life cycle stages declared."

- "The EPD owner has sole ownership, responsibility, and liability for the content of this EPD."
- If the EPD is based on a functional declared unit, the statement:

"This EPD defines the functional declared unit of storage products as defined by sub-category of the PCR. Depending upon the application, other options of the product should be considered when making comparisons. Added accessories or materials may be important in characterizing the performance of storage devices."

9.3 Declaration of the methodological framework

Per ISO 21930:2017¹ Clause 9.3, Table [2](#) shall be included in the EPD.

9.4 Declaration of technical information and scenarios

Per ISO 21930:2017¹ Clause 9.4.

9.5 Declaration of environmental indicators derived from LCA

9.5.1 LCA results from LCA

Per ISO 21930:2017¹ Clause 9.5.1.

9.5.2 LCA results from LCI

Per ISO 21930:2017¹ Clause 9.5.2, with the following clarification.

When upstream data are missing values for select impact categories or inventory items that are required to be reported in the EPD, these gaps shall be filled and documented, and be qualified with the footnote:

"Not all LCA datasets for upstream materials include these impact categories and thus results may be incomplete. Use caution when interpreting data in these categories."

9.6 Declaration of additional environmental information

Per ISO 21930:2017¹ Clause 9.6, with additional guidance from Sections [8.2](#) and [8.3](#).

The following references shall be provided at a minimum in the EPD:

- ISO 21930:2017, *Sustainability in Building Construction — Environmental Declaration of Building Products*
- NSF 1122-26, *BIFMA Storage*
- NSF, *Product Category Rules Program General Program Instructions*⁸

The functional unit shall also be reported in m³. Those results shall be preceded by the following statement:

"The following set of results are included here for ease of comparison with EPDs developed to a previous version of the PCR."

10 Project report

Per ISO 21930:2017¹ Clause 10, with the following additions.

EPDs for storage that are developed using a verified software tool do not need an individual project report for each EPD. Instead, the underlying LCA project report that has been third-party critically reviewed for the software tool shall serve as the project report for the EPD and shall be available to third-party verifier(s) of output EPDs. The underlying project report for the software tool shall conform to the requirements of Section [10](#) and ISO 21930:2017.

11 Verification and validity of an EPD

Per ISO 21930:2017¹ Clause 11.

12 References

12.1 ISO standards

ISO 6707-1: 2014, *Buildings and Civil Engineering Works – Vocabulary – Part 1: General Terms*¹

ISO 14021:2016, *Environmental Labels and Declarations – Self-declared Environmental Claims (Type II Environmental Labeling)*¹

ISO 14067:2018, *Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification*¹

ISO 14050:2009, *Environmental Management – Vocabulary*¹

ISO 15686-7:2017, *Buildings and constructed assets – Service life planning, Parts -1, -2, -7 and -8*¹

12.2 EN standards

EN 15804+A2:2019/AC 2021, *Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products, January 2012*²²

12.3 Other references

Atherton, John. *Declaration by the Metals Industry on Recycling Principles*, International Journal of Life Cycle Assessment, 12 (1), 59-60, 2007²⁹

²⁹ <internationaltin.org/wp-content/uploads/2018/01/DeclarationMetalsIndustryRecyclingPrinciples.pdf>

USGBC, *LEED v4 for Building Design and Construction* ³⁰

USGBC, *PCR Committee Process & Resources: Part B* ³¹

³⁰ US Green Building Council. 2101 L Street NW, Suite 600, Washington, DC 20037. <[usgbc.org/resources/leed-v4-building-design-and-construction-current-version](https://www.usgbc.org/resources/leed-v4-building-design-and-construction-current-version)>

³¹ US Green Building Council. 2101 L Street NW, Suite 600, Washington, DC 20037. <[usgbc.org/resources/pcr-committee-process-resources-part-b](https://www.usgbc.org/resources/pcr-committee-process-resources-part-b)>



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For more information, contact:
ncss@nsf.org

789 N. Dixboro Road Ann Arbor, MI 48105 USA
[nsf.org](https://www.nsf.org)