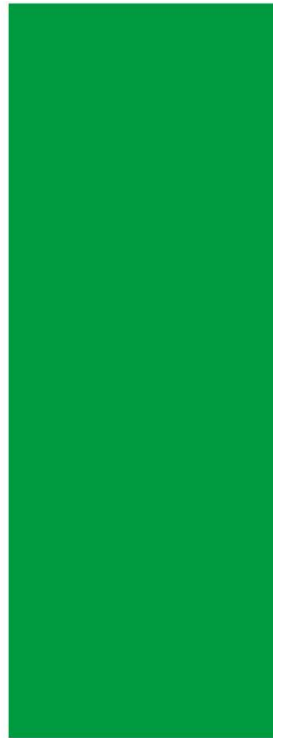
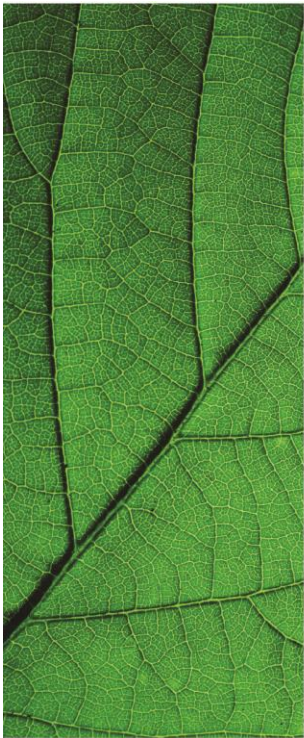


Product Category Rule

for Environmental Product Declarations

NGA PCR for Flat Glass: UN CPC 3711



Program Operator

NSF International

National Center for Sustainability Standards

Valid through September 30, 2025

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

NSF International shall ensure that reasonable balance among the members of a PCR committee is achieved and potential conflicts of interest are identified. No participation fees will be charged by NSF International to interested parties for participation on PCR Development Committees, for attendance at PCR Development Committee meetings, or for commenting on a draft PCR document.

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PCR REVISION HISTORY

Version	Date Issued
1	September 2013
2	September 2020



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Product Category Rule for Environmental Product Declaration:
PCR for FLAT GLASS

PCR DEVELOPMENT AND STAKEHOLDER CONSULTATION

This product category rule for “flat glass” is Version 2 of the Product Category Rules (PCR) for ISO 14025:2006 Type III Environmental Product Declarations (EPDs) of flat glass updating Version 1 dated September 2013.

The following changes have been included in this document:

- Updates normative references as applicable
- Terms and Definitions, and Abbreviated Terms have been added

No participation fees were charged by NSF to interested parties. NSF International ensured that reasonable balance among the members of the PCR committee were achieved and potential conflicts of interest were resolved prior to commencing this PCR development.

The development of this PCR was supported by the National Glass Association Forming Committee <www.glass.org> and its members.



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ABOUT NSF'S 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, 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 www.nsfustainability.org or contact ncss@nsf.org.

ABOUT THE NATIONAL GLASS ASSOCIATION (NGA)

Founded in 1948, the National Glass Association (NGA), www.glass.org, combined with the Glass Association of North America (GANA), www.glasswebsite.com on February 1, 2018 to form the largest trade association serving the architectural glass and metals industry supply chain, including glazing contractors, full-service glass companies, glass fabricators, primary glass manufacturers and suppliers to the industry. It is a technical powerhouse that brings some of the best minds to the table to create technical resources and promote and advocate for glass in buildings. NGA's education and training resources – both in print and online at MyGlassClass.com – and its official publications *Glass Magazine* and *Window & Door*, keep the industry knowledgeable and well-informed. NGA also produces the industry's largest annual trade show in the Americas, *GlassBuild America*, and hosts these events: Annual Conference, Building Envelope Contractors (BEC) Conference, Fall Conference, Glazing Executives Forum, and GPAD (Glass Processing Automation Days).



1 GENERAL INFORMATION

These product category rules (PCR) shall be used in preparing an Environmental Product Declaration (EPD) for *flat glass products* (note that, for the purpose of this PCR, any reference to flat glass in this document also refers to float and rolled glass). This document provides PCR for the assessment of the environmental performance of UN Central Product Classification 3711, flat glass, and the declaration of this performance by an EPD. This PCR includes the subclasses of 37112 – *Unworked cast, rolled, drawn or blown glass, in sheets*, 37113 – *Float glass and surface ground or polished glass, in sheets*, and 37114 – *Glass in sheets, bent, edge-worked, engraved, drilled, enamelled or otherwise worked, but not framed, etc.* Tinted glass is included in the scope of this PCR but additional processing such as coatings, tempering, and laminating are not included, but could be covered by other PCRs. This PCR is valid through September 30, 2025.

This PCR follows the following standards:

- ISO 14025, *Environmental labels and declarations – Type III environmental declaration*;
- ISO 14040, *Environmental management – Life cycle assessment – Principles and framework*;
- ISO 14044, *Environmental management – Life cycle assessment – Requirements and guidelines*;
- ISO 21930, *Sustainability in building construction – Environmental declaration of building products*.

This PCR follows the following standards, and complies with them as applicable:

- ASTM E2114-19, *Standard Technology for Sustainability Relative to the Performance of Buildings*;
- ASTM E2129-18, *Standard Practice for Data Collection for Sustainability Assessment of Building Products*;
- ASTM E2432-19, *Standard Guide for General Principles of Sustainability Relative to Buildings*; and
- EN 15804:2012, *Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products*.



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This document provides PCR for the assessment of the environmental performance of UN CPC 3711, flat glass and the declaration of this performance by an EPD. See the *Product Category Rules* section for an entire list of UN CPC subclasses covered in this PCR.

In an effort to facilitate harmonization with other existing PCRs, the existing Environdec PCR Basic Module for CPC Division 37: Glass and glass products and other nonmetallic products n.e.c, Version 1.0 2010-11-30 was reviewed. PCR Basic Modules are guidance templates for developing PCRs and do not represent a PCR document.

This document specifies the requirements for the Life Cycle Assessment (LCA) study and the format and content of the EPD itself. The scope for this PCR for the flat glass industry is based on manufacturing in North America. The PCR is primarily written to address the environmental impacts from cradle to gate: raw material extraction and energy flows, flat glass manufacture, packaging, and storage. The PCR does not include the use phase or the end of life management for the flat glass as the material is utilized for a wide variety of different products with unrelated uses, therefore, stages of use and disposal are not known.

The PCR document has been prepared by NSF International (the program operator) in accordance with ISO 14025 and 21930. An open enrollment period was provided to seek out stakeholders interested in being part of the PCR creation. A multi-stakeholder group composed of flat glass manufacturers, trade associations, sustainability consultants, window manufacturers, regulators, European manufacturers and trade associations, and LCA practitioners worked to create the PCR.

It is not recommended to compare LCA studies or EPDs from another PCR, other than this PCR, as there may be differences in methodology, assumptions and data quality. The purpose of this PCR is to provide transparent guidance for an organization to conduct an LCA and develop an EPD in an effort to measure progress toward environmental improvements or the organization's products being studied. This PCR is not intended to support comparative assertions.

1.1 Goal and scope requirements for the LCA study

The goal of this PCR is to specify the guidelines for developing a Type III EPD in conformance with ISO 14025 and 21930, based on an ISO 14040 and ISO 14044 compliant LCA.



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The goal of an LCA that conforms to this PCR shall be, at a minimum, to identify the environmental impacts of each life cycle phase of the product and be presented in such a way to be relevant to the public.

The purpose of this PCR is to provide transparent guidance for an organization to conduct an LCA and develop an EPD in an effort to measure progress towards environmental improvements of the organization's products being studied.

This PCR was not written to support comparative assertions. Even for similar products, differences in declared unit, use and end-of-life stage assumptions, and data quality may produce incomparable results. It is not recommended to compare LCA studies or EPDs with those of another organization as there may be differences in methodology; assumptions; allocation methods; data quality, such as variability in data sets; and results of variability in assessment software tools used. The purpose of this PCR is to provide transparent guidance for an organization to conduct an LCA, and develop an EPD, in an effort to measure progress toward environmental improvements of the organization's products being studied.

The scope of the LCA will include a description of the following according to this PCR:

1. Declared Unit
2. System Boundary
3. Description of data
4. Criteria for inclusion of inputs and outputs (cut off rules)
5. Data quality requirements and
6. Units

1.2 Terms and Definitions

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

Consider the following definitions as well as those specific to the industry:

cradle-to-gate: Covers the mandatory production stage that includes the following: extraction and upstream production (raw material supply), transport to factory and manufacturing.



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EPD – Product specific: EPD results for a specific product or group of flat glass categorized by performance and developed by a manufacturer for a specific product.

EPD – Industry average: EPD results for a specific product or group of flat glass categorized by performance for a specified region and or group of manufacturers.

flat glass: A general term that describes float glass, sheet glass, plate glass and rolled glass. Flat soda lime silicate (SLS) glass is manufactured by the reaction of various raw materials. While most of the raw materials used in SLS glass production are crystalline substances, the finished glass is not crystalline but amorphous. All of the raw material substances are consumed during the manufacture of the glass in order to provide specific physical, chemical and optical properties needed for the various applications and uses of the glass. The crystalline raw materials chemically and structurally transform into amorphous glass through a fusion (melting) process. Amorphous materials (like glass) do not have short range repeatable crystalline structures like crystalline materials (e.g., silica). As such, the finished glass product is completely different from the raw materials used to manufacture it, and no crystalline structures are present.

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 (www.epa.gov/rcra), see also 40 CFR 261.33 (www.govinfo.gov/content/pkg/CFR-2011-title40-vol26/pdf/CFR-2011-title40-vol26-sec261-33.pdf). For the Canadian market wastes are hazardous if they are regulated under the Canadian Environmental Protection Act, 1999 Regulations (www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/permit-hazardous-wastes-recyclables/management.html).

metric tonne: 1000 kilograms

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

1.3 Abbreviated Terms

AP: acidification potential

B2B: business-to-business

B2C: business-to-consumer

CEN: European Committee for Standardization

EP: eutrophication potential



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GWP: global warming potential

ODP: ozone depletion potential

POCP: photochemical oxidant creation potential

PS: product system

SB: system boundary

SM: secondary material

SFP: smog forming potential



2 PRODUCT DESCRIPTION

The product description shall include the name of the product, product manufacturer and/or model number, a general description of the product, and a picture of the product. Tinted glass is included in the scope of this PCR but additional processing such as coatings, tempering, and laminating are not included. The description of the product should state whether the glass is clear or tinted.

The product, or range of products, shall be identified by one metric tonne of glass required to meet the service lifetime identified in *Declared Unit*, Section 3.

Based on multiple LCAs from industry manufacturers, similar products (i.e., products with different tints, sizes, etc.) can 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 *Parameters to be Declared in the EPD*, Section 8 of ISO 14025.



3 DECLARED UNIT

The defined unit of a product is identified as functional unit or declared unit. If a declaration covers all stages of the life cycle of the product, i.e. cradle to grave, then the unit is defined as functional unit. If a declaration covers only certain stages of the life cycle of the product, i.e., cradle to gate, then the unit is defined as declared unit. The life cycle from cradle to gate will be covered in this PCR as identified in *System Boundaries*, Section 4. The declared unit shall be one metric tonne of flat glass, maintained for a 30-year



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period. For flat glass with a service life of more than 30 years, the entire impact shall be allocated to the 30-year period (i.e., the reference flow shall be one metric tonne of flat glass and results shall not be normalized from a fraction of one metric tonne of flat glass to meet the declared unit).

For flat glass with a service life of less than 30 years, a fractional approach may be used (i.e., it may take more than one metric tonne of flat glass to meet the declared unit requirements).

The number of declared units required shall be clearly stated on the front page of the EPD and unit values shall not be less than one.

3.1 Cut-off rules

Mass and energy flows that consist of less than 1% may be omitted from the inventory analysis. Cumulative omitted mass or energy flows shall not exceed 5%. Mass or energy flows that contribute more than 10% to an impact category shall be included.

When the exclusion of inputs and outputs is necessary, the following guidelines shall be followed:

- the calculation shall include all inputs and outputs to a unit process, where data is available. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions shall be documented in the EPD;
- where insufficient input data or data gaps for a unit process occur, the cut-off criteria shall be 1% of the total primary energy and 1% of the total mass input of that unit process; and
- the EPD shall include a description of the application of cut-off criteria and assumptions and a list of excluded processes.



4 SYSTEM BOUNDARIES

System boundaries are a set of criteria specifying which unit processes are part of a product system. The life cycle from cradle to gate will be covered including all industrial processes from raw material acquisition and pre-processing, flat glass manufacturing, packaging, and storage. Transportation after production, use, and end of life management will not be addressed in the scope of this PCR. All transportation related to raw material acquisition and pre-processing and production (including intercompany transportation between production and storage), up until the end of the production line (the gate) shall be included and reported in the LCA and the EPD. Transportation to waste/scrap facilities shall not be included. Rules on how recycling processes should be handled are described in detail in *Allocation Rules*, Section 5.

Production of capital goods, infrastructure, and personnel related activities should not be included unless shown to be relevant. System boundary example is shown below.

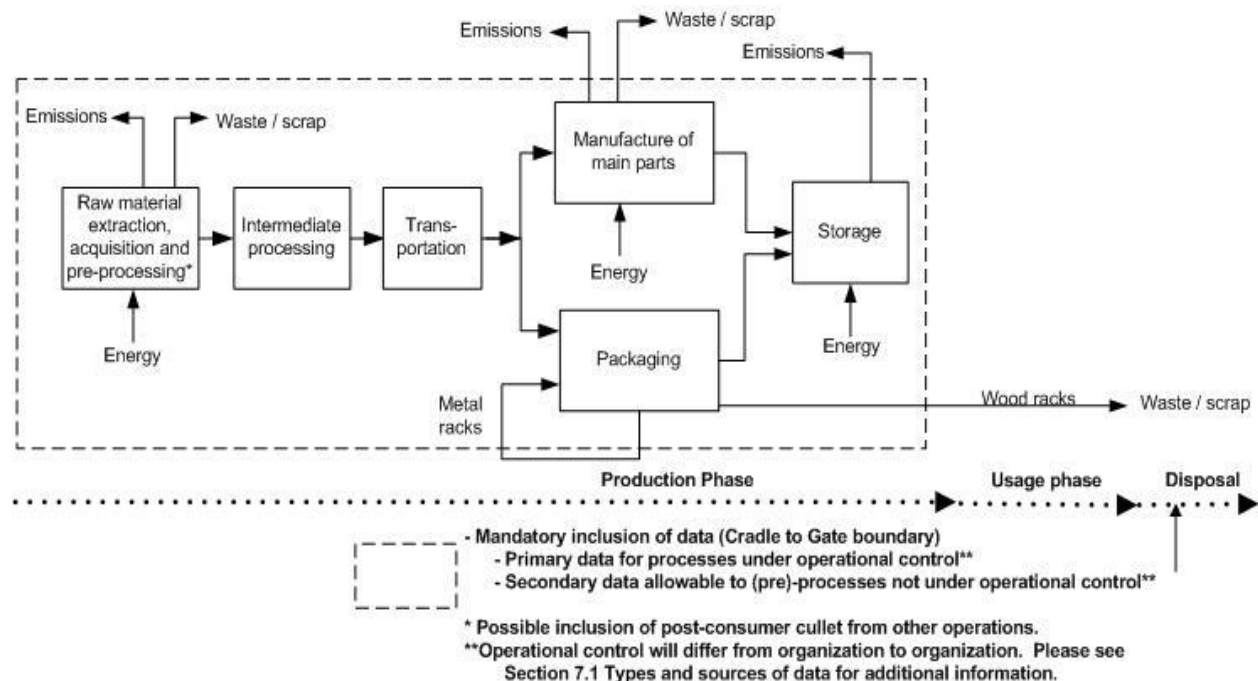


Figure 1
System Boundaries, example flow



4.1 System boundary

4.1.1 Material acquisition and pre-processing stage

The material acquisition and pre-processing stage starts when the material is extracted from nature, and ends when the materials reach the gate of the manufacturing facility. Materials can be considered either “primary” or “secondary”.

- primary materials are defined as those materials extracted from nature or newly manufactured; examples may include mined silica sand, soda ash, and limestone that are used to create basic materials used in the production of flat glass;

NOTE — Primary materials are not based on material quantities.

- secondary materials are recovered from previous use or from waste which substitutes primary materials and include the following parameters as defined in EN 15804:
 - secondary material is measured at the point where the secondary material enters the system from another system;
 - materials recovered from previous use or from waste from one product system and used as an input in another product system are secondary materials; and
 - examples for secondary materials (to be measured at the system boundary) are recycled scrap metal, crushed concrete, external glass cullet, recycled wood chips, recycled plastic-
- primary processing is the conversion of raw materials to flat glass through a manufacturing process.

For the material extraction and primary / intermediate processing stage, the boundary ends when the component reaches the gate of the production stage.



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Materials that contain recycled content (e.g., 30% post-consumer glass) as an input shall follow the cutoff method (recycled content method) as defined in *Allocation Rules*, Section 5.

Waste and scrap created during raw material acquisition and pre-processing shall be accounted for along with emissions associated with transporting the material to manufacturing centers. Primary data for transportation may be included in this section, if available.

For material waste not imbedded in software packages, or where primary data does not exist, scrap rates from commercial databases shall be used for the model. The transport distances shall be based on the US EPA Waste Reduction Model (WARM)⁷ and recycling rates shall be based on the US EPA Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures (current version)⁷ or other appropriate regionally applicable model.

All transportation prior to the material being used in the production stage shall be included.

Further, transport from the material stage to the production stage shall be included. If using an LCA tool where this transport data is not included or primary data does not exist, transport distances listed in Table 1 shall be used for the distance and method of transporting materials from the material acquisition and pre-processing stage to the production stage. Transport of the extracted raw materials within the acquisition and pre-processing stage is not covered in Table 1. As an example, a weighted average transportation distance can be used.



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Table 1

Materials transport distances, material acquisition, and pre-processing stage to production stage

Raw Material / Classification grouping		Distance (miles)		
		Rail	Truck*	Water
Silica Sand	13 Nonmetallic minerals	711 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	117 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	Great Lakes: 222 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹ Deep Draft (ocean vessel): 2,368 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹
Limestone	13 Nonmetallic minerals	711 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	117 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	Great Lakes: 222 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹ Deep Draft (ocean vessel): 2,368 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹
Soda Ash	13 Nonmetallic minerals	711 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	117 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	Great Lakes: 222 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹ Deep Draft (ocean vessel): 2,368 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹
Glass Pellets	31 Nonmetallic mineral products	414 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	126 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹	1,455 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7 ¹



Table 1

Materials transport distances, material acquisition, and pre-processing stage to production stage

NOTE: Oceanic distances were approximated.

Table 7¹ as referenced from: <www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/commodity_flow_survey/final_tables_december_2009/pdf/entire.pdf>

Distances taken from the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA) website's "TranStats".

NOTE: This table is not meant to represent all materials that may be found in flat glass.

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

4.1.2 Production

The production stage starts with the product components entering the production site and ends with the final product leaving the production line and stored onsite. This stage is intended to be "gate-to-gate", excluding any glass processing steps outside the defined scope of the PCR.

Gate-to-gate describes the product boundary encompassing the manufacture, packaging, and storage of flat glass. For purposes of the PCR, the entry gate is the receiving dock of the first facility where basic materials used in the manufacture of the flat glass are received. The end gate is the shipping dock where the flat glass is stored for shipment to fabricators or end users.

During production, the product undergoes the transformation from primary materials to the final product, which is then sold and used as a component in a variety of end uses. Additionally, any wastes formed during production shall be considered in this stage. Production includes processes such as:

- production of the flat glass from primary materials;
- any additional preparing of the finished product including cutting, machining and other processes, as appropriate; and
- materials used in packaging of the final product shall be included.



Waste and scrap in production shall be included in the LCA model. For the purpose of this PCR, waste and scrap (such as contaminated cullet, bad batch, batch spillage, and road sweepings) are defined as material not internally recycled back into the glass manufacturing process. Commercially available LCA software programs typically embed these flows in the modeling datasets. Primary data shall be used, if it is available.

For waste and scrap in production not imbedded in software packages modeling datasets, or when no primary data exists, a 5% scrap and waste rate shall be used for the model.

4.1.3 Packaging / storage

The storage stage starts with the product leaving the production line in the manufacturing process and ends when the product leaves the manufacturing facility to be delivered to end user or fabricator.

The packaging type shall be noted and included in the LCA to account for the various impacts due to different types of packaging.



5 ALLOCATION RULES

Allocation procedures shall be uniformly applied to similar inputs and outputs of the system under consideration. If allocation cannot be avoided, users shall follow procedures outlined in ISO 14044 for allocation procedures.

Where possible, allocation should be avoided by dividing unit processes shared with other product systems into two or more sub-processes (as specified in ISO 14044 Section 4.3.4, Allocation). If allocation cannot be avoided, the following allocation methods are preferred:

- mass, or other biophysical relationship; and
- economic value.



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Deviation from these allocation rules shall be documented and justified. Note that the three types of cullet are defined as:

- Internal cullet: Not considered secondary material for the purpose of this PCR.

Internal cullet is composed of the following: defective or off-specification products, detected and rejected by a quality control process during the industrial process of glass manufacturing; product transition phases (such as thickness and/or color changes); production off-cuts (such as edge trim); and inadvertently broken glass. These materials are immediately absorbed by the respective industrial process as a raw material for a new melting operation, and do not leave the glass manufacturing plant.

- Pre-consumer cullet: Not considered secondary material for the purpose of this PCR.

Pre-consumer cullet is waste glass resulting from the downstream processing of flat glass during the manufacture of products that contain glass as a component, and which leaves the facility where it was generated but has not yet reached the consumer market. Examples include off-cuts and broken glass from the fabrication of window units, which is returned to the flat glass manufacturing facility for re-melting. External cullet purchased from other flat glass manufacturing locations, that may or may not be suitable for use at the original manufacturing site as internal cullet, shall also be considered pre-consumer cullet, if used in the production process at a site other than the one in which it was originally generated.

- Post-consumer cullet: Considered a secondary material for the purpose of this PCR.

Post-consumer cullet is composed of returns from the end-of-service-life of a consumer product (such as windshields from dismantled automobiles and window units from decommissioned buildings). It is glass that would otherwise be considered waste, but is collected and/or reprocessed for the purpose of recycling.

For allocation due to recycling, companies shall use the Recycled Content Method. Allocation procedures for reuse and recycling discussed in ISO 14044 (see Section 4.3.4.3) shall be applied for recycling situations.



6 UNITS AND QUANTITIES

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. All LCIA data in IP (English) may be added.



7 CALCULATION RULES AND DATA QUALITY REQUIREMENTS

7.1 Types and sources of data

Primary data shall be used for facilities and processes under operational control of the reporting company. Representative data may be used for facility operations that contribute less than 10% of the total product output, with at least 50% of facility operations data are from a primary source. 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.

Primary data (site specific or representative 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).

The manufacturer shall declare whether the soda ash they are using in their operation is mined or manufactured.

7.2 Data quality

A data quality assessment shall be made for the system under study. All data shall be accurate, complete, and representative of the manufacturing process, current technology and current measurement capability.



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The data shall be consistent with the following requirements:

1. The information obtained from the manufacturing process(es) shall be averaged annual values with the yearly values documented and averaged, and it shall not be more than five years old. The usage of secondary data shall be less than 10 years old. If data older than 10 years is used from a secondary source, justification shall be included to address why newer data are not available.
2. Data should represent the technology(ies) and process(es) in current use.
3. Data quality assessment shall conform to ISO 14044, Section 4.2.3.6.
4. Data quality assessment shall, at a minimum, address the following:
 - time-related coverage: age of data and the minimum length of time over which data should be collected;
 - geographical coverage: geographical area from which data for unit processes should be collected to satisfy the goal of the study;
 - technology coverage: specific technology or technology mix; and
 - reliability of the information (e.g., data, models and assumptions).
5. Data quality assessments, examples include (but not limited to):
 - USLCI; and
 - ILCD.



6. Representative data should always be used in the upstream phases (extraction, processing and production). Information from databases may be regarded as representative data, if they fulfill 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; and
- boundaries towards technical systems shall be of best equivalence.

If representative data are not available, use of a specific proxy is allowed. The user shall document and justify the decision to use the specified proxy.

7.3 Data source

The source of all data shall be transparent, and the sources shall be readily available, accurate, and documented in the LCA report that supports the EPD for verification purposes.

7.4 Electricity modeling

The electricity model shall be coherent with the goal and scope as defined by the PCR. Where primary data is available for the electrical power grid for a given unit process, it shall be used to model the electricity source. If primary data is not available, the next highest aggregation of electrical grid data shall be used, with a preference of local, regional, national, and then multi-national. Plant specific energy mix data shall be based on regional energy data that is not greater than 5 years old. In the US, the source of national grid data is the US LCI Database. The selection of data used for the electricity model shall be noted and justified.

Plants outside of the US shall use country of origin specific data. The French LCA database will soon have estimates of the national grid for most countries globally. The ILCD database has estimates for the EU countries.



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Carbon offsets or Renewable Energy Credits or Certificates (RECs) shall not be used in the inventory. These refer to credits purchased for processes not under the operational control of the purchaser. For example, a coal fired power plant might buy carbon offsets that support the planting of forests, or might buy RECs that support the installation of renewable energy at distributed locations. On-site renewable energy from solar cells or other renewable energy source may only be included in the inventory if they are either net metered or not grid-linked. This process avoids the issue of double-counting renewable energy inputs.

7.5 LCIA methodology

The following environmental impact categories shall be disclosed in the EPD per declared unit for products manufactured in North America. The impact categories shall also be divided up into quantity of each impact category for materials acquisition and refining and production.

1. Climate Change / Global Warming Potential [Mass of CO₂-eq. in kg] – TRACI 2.1¹
2. Acidification Potential (AP) [SO₂ eq./ kg of emission] – TRACI 2.1¹
3. Eutrophication Potential (EP) [kg N eq. / kg of emission] – TRACI 2.1¹
4. Stratospheric Ozone Depletion [Mass of CFC-11 Equivalents in kg] – TRACI 2.1¹
5. Photochemical Ozone Creation Potential (POCP, or “Smog”) [kg O₃ eq. / kg of emission] – TRACI 2.1¹
6. Mineral Resource Depletion Potential [Mass of Fe equivalents in kg] – ReCiPe 2008²

¹ US EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). <www.epa.gov/nrmrl/std/sab/traci/>

² ReCiPe Mid/Endpoint method, version 1.05 July 2010. <www.lcia-recipe.net/>



7.6 Sensitivity analysis

A sensitivity analysis shall be performed for all major assumptions in the LCA model and a clear description of the influence associated with the environmental impact for each of the assumptions chosen.



8 PARAMETERS TO BE DECLARED IN THE EPD

References shall be the most recent version required at the time of the LCA. LCI data and Impact Assessment shall be declared in the EPD as detailed below.

8.1 Materials composition

Product specifications, consisting of material composition of the reference product, in kg per declared unit, and in percentage of total weight.

NOTE — The materials that are used to make flat glass are not present in the final material.

8.2 Life cycle inventory data

Inventory assessment categories shall be reported by life cycle stage (e.g., energy and water) and in total.

1. Emissions to air {kg}
 - a. SO_x, NO_x, CO₂e, CO, VOCs, Fe, (PM) total
2. Water usage and emission to water {kg}
 - a. phosphates, nitrates, dioxin, heavy metals (arsenic, lead, mercury, cadmium, and chromium)
 - b. consumption (total water input)



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3. Energy type and usages {MJ}

a. primary energy demand, fossil fuel-based energy, nuclear:

- primary energy demand may include energy utilized in the manufacturing process, glass processing and storage.

b. Renewable (solar, wind, hydro, biomass)

4. Waste management {kg}

- a. incineration with energy recovery
- b. incineration without energy recovery
- c. landfill (non-hazardous solid waste)
- d. hazardous waste
- e. landfill avoidance (recycling)

8.3 Impact assessment categories

Impact assessment categories shall be reported by life cycle stage and in total. Impact categories shall use the characterization models specified in *LCIA Methodology*, Section 7.5 of this PCR.

This PCR does not require reporting of human health and eco-toxicity due to their uncertainty. A statement addressing this exclusion shall be included in the declaration.

- 1. Climate Change/ Global Warming Potential (GWP)
- 2. Acidification Potential (AP)
- 3. Eutrophication Potential (EP)
- 4. Stratospheric Ozone Depletion
- 5. Photochemical Ozone Creation Potential (POCP, or “smog”)
- 6. Mineral Resource Depletion Potential



9 OTHER ENVIRONMENTAL INFORMATION

Information may be included on how the product should be handled during use, maintenance and recycling to reduce environmental impacts. Other factors such as noise, risk related issues, and Health, Safety and Environment (HSE) (i.e., ergonomic factors) may also be included in this section. Manufacturers may choose to disclose other environmental information directly related to the product and shall include methodology supporting that environmental information, including human health and eco-toxicity assessment impacts.

Additional environmental information may include:

- whether glass meets the REACH or RoHS specifications for the European market;
- conflict minerals – see Section 1502 of the Dodd-Frank Act, Security Exchange Commission (SEC);
- declare hazardous air pollutants that were emitted during the manufacturing process; and
- MSDSs/SDSs for glass ingredients are optional.

If SDSs (Safety Data Sheets) for glass products are provided, chemicals listed on the SDSs should be disclosed for all materials that make up 1% or more of the product by weight. SDSs reportable chemicals are defined in this PCR as a chemical listed on as SDS. Ninety-five percent (95%) of product weight should be accounted for. For base metals, materials can be based on generic composition defined by appropriate organizations' standards. No further review of wood and other natural fibers is required; however, products using these materials should report added SDSs reportable chemicals.



10 INDEPENDENT VERIFICATION

All verification of EPD, LCA, LCI and additional environmental information shall conform to ISO 14025, Section 8.1.3. The Type III EPD verification shall conform to ISO 14025, Section 8.1.4.

Verifiers shall conform to ISO 14025, Section 8.2. LCA expertise and conform to program operator instructions.



11 REFERENCES

ASTM E2114-19, *Standard Technology for Sustainability Relative to the Performance of Buildings*

ASTM E2129-18, *Standard Practice for Data Collection for Sustainability Assessment of Building Products*

ASTM E2432-19, *Standard Guide for General Principles of Sustainability Relative to Buildings*

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

EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)¹

FTC Part 260, Green guides³

(ILCD, 2010) Joint Research Commission, 2010, ILCD Handbook: *General Guide for Life Cycle Assessment*⁴

Intergovernmental Panel on Climate Change (IPCC)⁵

ISO 14025:2006, *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*⁶

ISO 14040:2006, *Environmental management – Life cycle assessment – Principles and framework*⁶

ISO 14044:2006, *Environmental management – Life cycle assessment – Requirements and guidelines*⁶

ISO 21930, *Sustainability in building construction – Environmental declaration of building products*⁶

³ Federal Trade Commission. <www.ftc.gov>

⁴ <<http://lct.jrc.ec.europa.eu>>

⁵ World Meteorological Organization (secretariat to IPCC), 7bis Avenue de la Paix, C.P. 2300, CH- 1211 Geneva 2, Switzerland. <www.ipcc.ch>

⁶ International Organization for Standardization (ISO), Case postale 56, CH-1211 Geneve 20, Switzerland. <www.iso.org>



US EPA Waste Reduction Model (WARM)⁷

World Business Council for Sustainable Development's Global Water Tool⁸

World Resources Institute (WRI) Product Life Cycle Accounting and Reporting Standard⁸



12 EPD FORMAT

The format of the EPD should be structured as follows:

A. Front page:

1. To avoid misinterpretation of results, a company shall include a disclaimer to the audience (reader) identifying the difficulties in comparing results and referring the reader to additional information if needed:

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

2. Name of the declared product
3. Picture of product
4. Manufacturer's name and contact information

⁷ US EPA Waste Reduction Model <www.epa.gov/sites/production/files/2018-02/documents/warm-users-guide_v14_march2018.pdf

⁸ WRI Product Life Cycle Accounting and Reporting Standard October 2011



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5. Information on the EPD program operator
 6. Name of PCR (NGA PCR for Flat Glass: UN CPC 3711)
 7. Date of certification and period of validity
 8. Declared unit
 - i. 30-year service life
- B. Product formulation:
1. For sector average EPDs, the product formulation shall be identified to enable the EPD user to understand the composition of the product.
 2. The product formulation for a specific EPD is optional for confidentiality reasons. The product formulation or the MSDS of the product, shall be declared. A health product declaration shall also be declared if one exists.
- C. Product specifications, as described in *Product Description*, Section 2
- D. Identify and provide information on what life cycle stages are not considered
- E. Material resources, sorted by:
1. Virgin renewable resources
 2. Recycled resources
 3. Virgin non-renewable resources



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F. Energy consumption:

1. Fossil fuels
2. Nuclear fuels
3. Renewable fuels
4. Miscellaneous fuels (surplus heat, incineration of waste)

G. Impact assessment categories, as specified in *Impact Assessment Categories*, Section 8.3

H. Emissions and wastes, as specified in *Parameters to be Declared in the EPD*, Section 8

I. Additional environmental information per *Other Environmental Information*, Section 9

J. References, as specified in *References*, Section 11

K. In the instance where an EPD declares an average performance for a number of products, it shall include a statement that the EPD document represents an average performance. In addition, information on the deviation of the products' performance with respect to the average shall be stated.

L. The EPD shall declare the site(s), manufacturer or group of manufacturers, or those representing them, for whom the results of the LCA are representing.

M. Include information pertaining to where explanatory information about the EPD content can be obtained.



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N. The EPD shall provide the following information:

PCR review was conducted by: <i>Example:</i> Name of the chair, organization, and means by which to contact the chair through the program operator
Independent verification of the declaration and data, according to ISO 21930 and ISO 14025 <input type="checkbox"/> internal <input type="checkbox"/> external
(Where appropriate) Third-party verifier: <i>Example:</i> Name of third-party verifier

As indicated in ISO 14025 and ISO 21930, third party verification is optional for business-to-business communication and mandatory for business-to-consumer communication.

12.1 Period of validity for the EPD

The validity of the EPD shall be reported in the EPD, and shall not exceed a five (5) year period from the date of issuance. If changes in any of the environmental impacts are larger than $\pm 5\%$, the EPD shall be adjusted. The EPD shall be reviewed and reissued every five years from the date of issuance or earlier, as appropriate.

12.2 References

The EPD shall, if relevant, refer to:

- the underlying LCA report;
- the relevant PCR document;
- other documents that complement, verify, and support the EPD;
- instruction for recycling; and
- program operator instructions.