



INTERNATIONAL
CLIMATE
INTELLIGENCE SYSTEM

ICIS PCR for Glass Products



ICIS PCR for Glass Products
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General

The ICIS Product Category Rules (PCR) for Glass establish a standardized methodology for conducting Life Cycle Assessments (LCAs) and developing Environmental Product Declarations (EPDs) specific to glass products. Developed under the International Climate Intelligence System (ICIS) and aligned with ISO 14025, ISO 21930, and EN 15804 standards, these rules ensure consistency, comparability, and transparency in the environmental assessment of glass across its full life cycle—from raw material extraction to end-of-life.

This PCR provides product-specific guidance for manufacturers, sustainability professionals, and third-party verifiers to account for environmental impacts in a credible and uniform manner. It enables stakeholders to produce EPDs that are aligned with international disclosure frameworks and procurement requirements, including green building certifications and eco-labeling systems.

Key features of the ICIS PCR for Glass products include:

- Defined system boundaries and functional units tailored to glass applications.
- Standardized impact categories and calculation procedures for environmental indicators such as global warming potential, water use, and energy demand.
- Data quality requirements and verification protocols to support third-party certification.
- Support for industry-wide benchmarking and continuous environmental improvement.

By following this PCR, glass manufacturers and stakeholders can strengthen the integrity of environmental claims and support market transition toward more sustainable and low-impact materials.

Disclaimer

This document is intended for informational and methodological purposes as part of the ICIS Product Category Rules (PCR) for Glass. It does not serve as a product certification or regulatory compliance guide. While it reflects the current standards and best practices for conducting environmental assessments and preparing EPDs, users must ensure alignment with national laws, regional product standards, and applicable industry protocols.

ICIS reserves the right to update the PCR content to reflect changes in international standards, environmental methodologies, and sector-specific data. ICIS does not accept responsibility for any misinterpretation, misuse, or inaccuracies arising from application of this document. For official EPD program participation or verification requirements, users should consult www.climateintell.com or engage directly with an ICIS-accredited program operator or verifier.

Table of Contents

1.0 INTRODUCTION & PURPOSE	3
2.0 SCOPE AND PRODUCT CATEGORY DEFINITION	3
2.1 Product Types Covered.....	3
2.2 Inclusion and Exclusion Criteria.....	3
2.3 Geographic and Functional Scope	4
3.0 RELATED STANDARDS AND INDUSTRY CONTEXT	4
3.1 Industry Collaborations	4
3.2 Alignment with International Standards	4
3.3 Integration with Green Building Certifications.....	5
4.0 MATERIALS AND PRODUCT DESCRIPTION.....	5
4.1 Primary Glass Types.....	5
4.2 Coatings Interlayers and Surface Treatments	5
4.3 Framing and Assembly Components	5
4.4 Technical Documentation Requirements	5
5.0 SYSTEM BOUNDARIES AND LIFE CYCLE STAGES	6
5.1 Cradle-to-Grave Approach.....	6
5.2 Life Cycle Stages: Extraction Manufacturing Use End of Life	6
5.3 Transportation and Maintenance Impacts.....	6
5.4 Cut-Off Criteria for Exclusions	6
6.0 DATA COLLECTION AND QUALITY REQUIREMENTS	7
6.1 Primary Data Collection Standards.....	7
6.2 Secondary Data Guidelines.....	7
6.3 Data Quality and Representation Assessment	7
6.4 Frequency and Update Recommendations	8
7.0 Calculation Rules and Functional Unit	8
7.1 Declared Unit (1m ²).....	8
7.2 Allocation Procedures and Documentation	8
7.3 Transparent Reporting Across Life Cycle Phases	8
8.0 ENVIRONMENTAL IMPACT CATEGORIES AND INDICATORS.....	9
8.1 Climate Change Impacts	9
8.2 Ecosystem Quality Indicators	9
8.3 Resource Utilization.....	9

8.4 Indoor Environmental Quality	9
9.0 VERIFICATION AND REPORTING REQUIREMENTS	10
9.1 Third Party Verification Protocols	10
9.2 EPD Reporting Format and Structure	10
9.3 Transparency and Digital Accessibility	11
9.4 Data Validation and Publication Requirements	11
10.0 APPLICATION AND USE OF THE PCR FOR GLASS PRODUCTS	11
10.1 Manufacturer Use for Sustainability Communication	11
10.2 Specifier and Designer Decision Making Support	11
10.3 Use in Green Building Certifications	12
10.4 ESG And Corporate Sustainability Reporting	12
10.5 Whole Building LCA and Project Integration	12
11.0 SUMMARY AND REFERENCES	12

1.0 INTRODUCTION & PURPOSE

Product Category Rules (PCRs) serve as the foundational framework for developing Environmental Product Declarations (EPDs) within the glass industry. These rules establish a consistent methodology for conducting Life Cycle Assessments (LCAs), ensuring that environmental impacts are measured and reported in a standardized manner across all glass products. By following these guidelines, manufacturers can generate EPDs that provide reliable, transparent, and comparable environmental information.

The primary purpose of this PCR document is to eliminate inconsistencies in how glass products' environmental impacts are assessed. Without standardized rules, different manufacturers might employ varying methodologies, system boundaries, or impact categories, making it impossible to fairly compare the environmental performance of competing products. This PCR addresses such disparities by prescribing specific requirements for data collection, calculation methods, and reporting formats.

For glass manufacturers, these rules provide clear guidance on how to communicate their products' environmental credentials effectively. The resulting EPDs become powerful marketing tools that showcase sustainability commitments and environmental performance. For buyers, architects, and specifiers, EPDs based on this PCR offer trustworthy information to support environmentally conscious purchasing decisions.

In alignment with ICIS standards, this PCR emphasizes transparency, scientific rigor, and accessibility of information. It creates a common language for environmental communication within the glass industry, fostering greater accountability and continuous improvement in sustainability performance.

2.0 SCOPE AND PRODUCT CATEGORY DEFINITION

2.1 Product Types Covered

This PCR encompasses a broad range of glass products utilized in both construction and industrial applications. It specifically addresses finished glass products that are ready for installation or implementation in their intended end-use applications. The scope includes, but is not limited to, flat glass, laminated glass, insulated glass units (IGUs), tempered glass, and fully assembled fenestration systems such as windows, curtain walls, and storefronts.

2.2 Inclusion and Exclusion Criteria

The product definition category extends to exterior-grade assembled products that incorporate glass as a primary component. These may include various frame materials (aluminum, vinyl, wood, fiberglass, or composite) when part of an integrated fenestration assembly. For clarification, this PCR

applies to products where glass serves as the principal functional element, regardless of additional components that may be present in the final assembly.

Explicitly excluded from this PCR's scope are raw materials or unprocessed glass that has not been transformed into a final product form. This includes raw glass cullet, unprocessed float glass still requiring further fabrication, and individual components intended for assembly into a finished product at a later stage. Additionally, specialty glass products with highly specific applications outside of typical construction or industrial use cases may require supplementary guidelines beyond those outlined in this document.

2.3 Geographic and Functional Scope

The geographical scope of this PCR is global, allowing for international application while acknowledging regional variations in manufacturing processes, energy sources, and regulatory requirements. When applied to specific products, manufacturers must clearly indicate the relevant geographical context to ensure proper interpretation of the resulting EPDs.

3.0 RELATED STANDARDS AND INDUSTRY CONTEXT

3.1 Industry Collaborations

This PCR for glass products has been developed in coordination with leading industry organizations to ensure alignment with existing standards and practices. It builds upon collaborative efforts between the National Glass Association (NGA), the Fenestration and Glazing Industry Alliance (FGIA), and the Window & Door Manufacturers Association (WDMA), who previously established the foundation for fenestration PCR development. This integration of industry expertise ensures that the guidelines reflect current manufacturing practices and technical considerations specific to glass products.

The methodological framework adheres to the principles established by the US Environmental Protection Agency (EPA) and NSF International for PCR development. These principles emphasize transparency, stakeholder engagement, and scientific validity throughout the creation process. By following these established protocols, this PCR maintains credibility and ensures acceptance across regulatory environments.

3.2 Alignment with International Standards

The ICIS PCR for Glass products are designed to align with internationally recognized technical and performance standards to ensure methodological consistency, scientific rigor, and global comparability. The framework incorporates NFRC (National Fenestration Rating Council) standards for sizing and configuration of glass products, along with ASTM E1423 to guide glass testing methodologies. For life cycle assessment (LCA), the PCR follows the foundational principles outlined in ISO 14040/14044, and aligns with EN 15804 for sustainability assessments of construction products. In terms of performance, the PCR references DIN EN standards for glass durability, ASTM

C1036 for flat glass quality requirements, ISO 12543 for laminated glass performance, and ANSI Z97.1 for safety glazing materials. This comprehensive integration of global standards ensures that glass EPDs developed under ICIS are robust, credible, and widely applicable across markets and regulatory environments.

3.3 Integration with Green Building Certifications

This PCR also acknowledges the global context of glass manufacturing by incorporating international standards such as the European Committee for Standardization (CEN) guidelines and International Organization for Standardization (ISO) frameworks. Where regional variations exist, this document provides flexibility while maintaining core methodological consistency. The alignment with multiple standards facilitates acceptance of resulting EPDs in various green building certification systems, including LEED, BREEAM, and Green Globes.

4.0 MATERIALS AND PRODUCT DESCRIPTION

4.1 Primary Glass Types

Glass products covered by this PCR encompass a diverse range of compositions and configurations, each with unique properties and applications. The primary glass types addressed include soda-lime glass (the most common form used in windows and containers), borosilicate glass (known for thermal resistance), and specialty glass formulations with enhanced performance characteristics. This PCR also covers processed variants such as laminated glass (with polymer interlayers for safety and acoustic performance), tempered glass (thermally or chemically strengthened), and insulated glass units (multiple panes with sealed air or gas spaces).

4.2 Coatings Interlayers and Surface Treatments

Special consideration is given to coatings and treatments that significantly affect both performance and environmental impact. These include low-emissivity (low-E) coatings, solar control films, self-cleaning treatments, and decorative finishes. For laminated products, the PCR addresses various interlayer materials such as polyvinyl butyral (PVB), ethylene-vinyl acetate (EVA), and ionoplast interlayers.

4.3 Framing and Assembly Components

When glass is part of an assembled system, the assessment must include relevant framing materials such as aluminum, vinyl, wood, fiberglass, or composite, along with associated hardware, sealants, and weather stripping. These components should be evaluated as part of the declared unit, especially where they significantly influence performance or environmental impact.

4.4 Technical Documentation Requirements

Products must be assessed as per the declared unit specified in this PCR, typically one square meter of the assembled glass system. Manufacturers must clearly document all materials comprising the product, including their mass percentage, sourcing information, and relevant technical

specifications. Where proprietary formulations exist, reasonable disclosure must balance transparency requirements with legitimate confidentiality concerns.

5.0 SYSTEM BOUNDARIES AND LIFE CYCLE STAGES

5.1 Cradle-to-Grave Approach

This PCR mandates a comprehensive cradle-to-grave approach for glass products, encompassing all significant life cycle stages. It begins with raw material extraction and continues through manufacturing, use, and end-of-life phases. The goal is to evaluate the environmental impacts across the entire life cycle of the product.

5.2 Life Cycle Stages: Extraction Manufacturing Use End of Life

- **Extraction:** The assessment starts with mining operations for silica sand and other required minerals, including their processing and transportation to manufacturing facilities.
- **Manufacturing:** This stage involves energy consumption, material inputs, emissions, and waste related to production processes such as melting, forming, cutting, tempering, coating, and assembly.
- **Use:** Especially significant for building applications, the use phase considers thermal performance impacts on long-term energy consumption. It also accounts for maintenance, cleaning, and potential replacement needs during service life.
- **End-of-Life:** This phase captures impacts from disposal, recycling, or reuse. For composite products like fenestration systems, separate assessments are required for glass and framing components if their disposal pathways differ.

5.3 Transportation and Maintenance Impacts

Transportation is evaluated throughout the product life cycle, including:

- Delivery of raw materials to manufacturing sites
- Distribution of finished products to construction sites or points of use
- End-of-life transport to recycling or disposal facilities

The use phase includes the environmental impact of maintenance, such as cleaning operations and any interim repairs or replacements over decades of product life.

5.4 Cut-Off Criteria for Exclusions

To maintain assessment manageability while ensuring completeness, the PCR specifies cut-off criteria:

- Processes may be excluded if they contribute less than 1% of total impact per category
- Cumulative exclusions must not exceed 5% of total impacts
- All relevant inputs and outputs crossing the system boundary must still be quantified, including energy flows, material usage, emissions to air/water/soil, and waste streams.

6.0 DATA COLLECTION AND QUALITY REQUIREMENTS

6.1 Primary Data Collection Standards

Rigorous data collection is essential for credible EPDs. This PCR emphasizes the use of primary data for processes under the manufacturer's direct control. Manufacturers must:

- Use verified, facility-specific data on energy consumption, material inputs, emissions, and waste.
- Ensure the data reflects a minimum of one year of production or multiple representative production runs to account for variability.
- For multi-site operations, collect data from all relevant sites and calculate a production-weighted average for the consolidated EPD.

Primary data requirements include:

- Site-specific energy consumption (by type and quantity)
- Material inputs (quantities and specifications)
- Direct process emissions
- Waste generation and treatment
- Transportation distances and modes (inbound and onsite logistics)

6.2 Secondary Data Guidelines

Secondary data may be used for processes outside the manufacturer's direct control, such as upstream raw material extraction and external electricity generation. This PCR mandates the use of:

- Peer-reviewed, published databases or studies
- Datasets that are less than 5 years old
- Data that are technologically and geographically representative

All secondary data sources must be fully documented, including publication date, scope of data, and assumptions or limitations. Preference must be given to peer-reviewed datasets over proprietary or unverified data sources.

6.3 Data Quality and Representation Assessment

To ensure robust assessments, data must undergo a comprehensive quality review. The following criteria must be evaluated:

- Temporal representativeness – Is the data current and reflective of the reporting period?
- Geographical representativeness – Is the data relevant to the region where production occurs?
- Technological representativeness – Does the data match the actual technologies and processes used?
- Completeness – Are all relevant flows and inputs included?
- Consistency and reproducibility – Are the data collection and handling methods transparent and repeatable?

Data validation processes must be used to identify anomalies and correct inconsistencies, with documentation of any gap-filling, allocation, or data treatment approaches.

6.4 Frequency and Update Recommendations

Given the dynamic nature of industrial operations and supply chains, this PCR recommends:

- Reviewing and updating data every 3 to 5 years, or
- Updating sooner if there are significant changes in manufacturing processes, energy sources, or material sourcing.

Regular updates ensure that EPDs remain relevant and accurate for stakeholders, supporting credible benchmarking and decision-making based on environmental performance.

7.0 Calculation Rules and Functional Unit

7.1 Declared Unit (1m²)

Consistent calculation methodologies are essential for generating comparable and reliable Environmental Product Declarations. This PCR establishes a standardized declared unit for glass products, defined as one square meter (1m²) of fenestration assembly, including both glass and frame components where applicable. This unit provides a common reference point against which all environmental impacts are measured and reported, facilitating meaningful comparisons between similar products.

7.2 Allocation Procedures and Documentation

For products with variable configurations, such as windows with different glass-to-frame ratios, manufacturers must clearly document the specific configuration assessed and provide guidance on how results might scale for alternative dimensions. The PCR requires transparent reporting of the glass-to-frame ratio by mass and surface area, acknowledging that this relationship significantly influences overall environmental impact. Where relevant, thermal performance characteristics (U-factor, Solar Heat Gain Coefficient) must be included as these factors affect building energy consumption during the use phase.

Product Type	Declared Unit	Reference Service Life
Flat Glass	1m ² of specified thickness	N/A (intermediate product)
Insulated Glass Unit	1m ² of assembled unit	30 years
Window Assembly	1m ² of complete window	30 years
Curtain Wall System	1m ² of installed system	40 years

7.3 Transparent Reporting Across Life Cycle Phases

All calculations must follow internationally recognized LCA methodologies as defined in ISO 14040/14044 standards. Allocation procedures for multi-output processes must prioritize subdivision of processes where possible, followed by physical allocation (based on mass, energy

content, or other physical properties), and economic allocation only when no other basis exists. The PCR requires explicit documentation of all allocation decisions to ensure transparency.

For comparative transparency, results must be normalized to the declared unit and presented in a format that clearly distinguishes between life cycle stages. The PCR mandates separate reporting of impacts associated with the product stage (raw materials, transport, manufacturing), construction stage (transport to site, installation), use stage (operational energy implications, maintenance), and end-of-life stage (deconstruction, transport, processing, disposal). This disaggregated reporting allows stakeholders to understand where in the life cycle the most significant impacts occur.

8.0 ENVIRONMENTAL IMPACT CATEGORIES AND INDICATORS

Comprehensive environmental assessment requires evaluation across multiple impact categories to reflect the full spectrum of potential effects. This PCR mandates reporting on a core set of indicators calculated using internationally recognized methodologies for scientific validity and comparability.

8.1 Climate Change Impacts

- Global Warming Potential (GWP) in kg CO₂ equivalent
- Separate reporting for fossil, biogenic, and land-use change contributions
- Biogenic carbon accounting applies to wood components in framing systems

8.2 Ecosystem Quality Indicators

- Acidification Potential (AP) – kg SO₂ equivalent
- Eutrophication Potential (EP) – kg PO₄³⁻ equivalent
- Photochemical Ozone Creation Potential (POCP) – kg C₂H₄ equivalent
- Ozone Depletion Potential (ODP) – kg CFC-11 equivalent

8.3 Resource Utilization

- Abiotic Resource Depletion Potential (ADP) for minerals/metals and fossil fuels
- Primary energy demand – renewable and non-renewable
- Fresh water use and water scarcity footprint

8.4 Indoor Environmental Quality

- VOC emissions
- Formaldehyde and other hazardous substance releases
- Particulate matter formation

Beyond these required indicators, manufacturers may report additional impact categories such as human toxicity potential, ecotoxicity potential, or land use changes when relevant to their specific products. The PCR encourages reporting of product-specific parameters that provide further insight into environmental performance, such as recyclability, recycled content, hazardous material content, and waste generation during production.

For glazing systems with significant implications for building energy performance, this PCR requires supplementary reporting on thermal and optical properties that influence operational energy consumption. These include U-value (thermal transmittance), Solar Heat Gain Coefficient (SHGC), and Visible Light Transmittance (VLT). These parameters enable stakeholders to evaluate how the glass product might affect building energy consumption throughout its service life, potentially offsetting production-phase impacts through operational efficiency.

All impact assessments must use current, scientifically recognized characterization models. The PCR specifically recommends using the latest version of the Environmental Footprint (EF) method developed by the European Commission's Joint Research Centre, while acknowledging that regional variations may necessitate alternative methodologies in certain markets.

9.0 VERIFICATION AND REPORTING REQUIREMENTS

9.1 Third Party Verification Protocols

All Environmental Product Declarations developed under this PCR must undergo rigorous third-party verification to ensure compliance with the methodological framework and reporting requirements. Independent verifiers must have recognized expertise in life cycle assessment and relevant industry knowledge. The verification process examines the completeness, accuracy, and credibility of the underlying LCA study, the representation of results in the EPD, and compliance with ISO 14025 and this PCR document.

Verifiers must confirm that data collection, modeling approaches, and calculation methods align with the requirements outlined in previous sections. They assess whether appropriate system boundaries have been applied, whether allocation procedures follow prescribed hierarchies, and whether cut-off criteria have been properly implemented. The verification statement, including the verifier's name and affiliation, must appear in the published EPD.

9.2 EPD Reporting Format and Structure

EPDs developed under this PCR must present information in a clear, transparent format following the ICIS reporting template. The document must begin with a concise summary of key environmental performance indicators, followed by comprehensive information about the product, its technical characteristics, and the scope of the assessment. All life cycle stages included in the assessment must be clearly identified, with transparent documentation of any stages excluded from the analysis.

Results for each environmental impact category must be presented in tabular format, disaggregated by life cycle stage to provide insight into which phases contribute most significantly to overall impact. The EPD must include a graphical representation of key results to enhance comprehension. Additional mandatory reporting elements include a description of data quality, disclosure of allocation methods, clear documentation of assumptions and limitations, and guidance on interpreting results.

9.3 Transparency and Digital Accessibility

In alignment with ICIS principles, this PCR emphasizes digital accessibility and machine-readability of environmental data. EPDs should be published in formats that enable easy extraction of quantitative information for further analysis or integration into building information modeling (BIM) systems. To facilitate transparency, manufacturers must maintain background reports documenting the full LCA study, which must be made available to verifiers and, upon request, to customers or regulatory authorities.

9.4 Data Validation and Publication Requirements

The validity period for EPDs developed under this PCR is five years from the date of issue. However, manufacturers must update their declarations if significant changes occur in the product, manufacturing process, or underlying data that could materially affect the environmental impact results. This ensures that stakeholders always have access to current, relevant information about the environmental performance of glass products in the marketplace.

10.0 APPLICATION AND USE OF THE PCR FOR GLASS PRODUCTS

The Product Category Rules (PCR) for glass products act as a foundation for transparent environmental communication and informed decision-making across the construction value chain. It enables the creation of standardized, comparable EPDs that serve multiple strategic functions.

Additionally, these PCRs follow the International standards, which provide practical guidance on how to develop, verify, and publish EPDs. This alignment ensures that EPDs developed using these standards will be compatible with the global EPD programs, facilitating international recognition and acceptance.

Effective communication of environmental performance requires clear, consistent, and transparent reporting. This PCR establishes reporting requirements that ensure EPDs for glass products are accessible to diverse stakeholders while maintaining scientific rigor. The reporting format should follow the EN 15804 template and ICIS General Program Instructions with modifications as needed to accommodate glass sector-specific information.

10.1 Manufacturer Use for Sustainability Communication

Glass manufacturers can use this PCR to develop credible EPDs that:

- Communicate environmental performance transparently
- Highlight sustainability achievements
- Identify areas for process or material improvements
- Address market demands for environmental accountability

10.2 Specifier and Designer Decision Making Support

Architects, designers, and specifiers benefit by using EPDs to:

- Compare glass products based on consistent environmental metrics

- Integrate sustainability into material selection
- Support efforts to reduce embodied carbon in building projects

10.3 Use in Green Building Certifications

EPDs developed under this PCR contribute to:

- LEED, BREEAM, Green Globes, and similar rating systems
- Earning credits related to transparency and reduced environmental impact
- Supporting certification efforts for sustainable buildings

10.4 ESG And Corporate Sustainability Reporting

This PCR provides verified data for use in:

- Sustainability reports
- Carbon disclosure programs
- Environmental, Social, and Governance (ESG) documentation
- Strengthening corporate environmental accountability

10.5 Whole Building LCA and Project Integration

The standardized EPDs enable:

- Accurate calculation of embodied carbon
- Integration with Life Cycle Assessment (LCA) tools at the project level
- Environmental benchmarking of glass products in the context of entire buildings

By creating a common methodology, this PCR promotes continuous improvement across the glass industry. It helps stakeholders—from manufacturers to policymakers—access reliable environmental data that supports innovation, market transformation, and the global climate agenda led by ICIS.

11.0 SUMMARY AND REFERENCES

PCR for Glass Products provide a robust framework for assessing and communicating the environmental performance of glass products throughout their life cycle. By establishing consistent methodologies, system boundaries, calculation rules, and reporting requirements, these PCRs enable credible environmental claims that facilitate market transparency and fair comparisons between products with equivalent functions.

The environmental assessment of glass products presents unique challenges due to complex production processes, diverse applications, and potential impacts across multiple environmental categories. These PCRs address these challenges through specific guidance on allocation methods for multi-output processes, content declaration requirements that balance transparency with business confidentiality and comprehensive environmental indicators that capture the most relevant impact categories for glass products.

By following these PCRs, glass manufacturers can develop Environmental Product Declarations that provide valuable information to customers, regulators, and other stakeholders. These EPDs support

informed decision-making in procurement, product development, and policy formulation, driving continuous improvement in the environmental performance of the glass industry. The standardized approach also reduces the burden on manufacturers by establishing clear rules that streamline the assessment process and avoid duplicative efforts.

- **References:** For the latest PCRs and updates, visit www.climateintell.com and ISO 14025, ISO 14040/44, and the International Climate Intelligence System General Program Instructions and EN 15804.

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