

**PRODUCT CATEGORY RULES FOR PREPARING
AN ENVIRONMENTAL PRODUCT DECLARATION
FOR PRODUCT GROUP**



PCR

VERSION ADOPTION
JULY 2014

VALIDITY PERIOD
JUNE 2019

Asphalt Shingles, Built-up Asphalt Membrane Roofing and Modified Bituminous Membrane Roofing

The product group includes asphalt shingles applied over underlayment, and low-slope roofing assemblies consisting of various combinations of factory-produced asphalt-saturated/coated base sheets, ply sheets and cap sheets together with specified viscous asphalt coatings, adhesives and surfacings.

REFERENCED PCR:

The Norwegian EPD Foundation (EPD-Norge) PCR for “Roof Waterproofing”, NPCR 22, Issued October 12, 2012



Asphalt Shingles, Built-up Asphalt Membrane Roofing and Modified Bituminous Membrane Roofing

Scope of Validity of these PCR

The product group includes asphalt shingles applied over underlayment, and low-slope roofing assemblies consisting of various combinations of factory-produced asphalt-saturated/coated base sheets, ply sheets and cap sheets together with specified viscous asphalt coatings, adhesives and surfacings.

Program Operator

ASTM International

Interested Parties

Representatives of the following organizations participated in development of the PCR:

The Asphalt Roofing Manufacturers Association (ARMA) and representatives of its member companies: Atlas Roofing, Building Products of Canada, Saint-Gobain (CertainTeed), GAF, Johns-Manville, Malarkey Roofing, Owens Corning and TAMKO.

Review Panel

François Charron-Doucet, Quantis Canada (Chairperson)

Andre Desjarlais, Oak Ridge National Laboratory

James Hoff, TEGNOS Research Inc.

The PCR peer review report is available upon request at: cert@astm.org

.....

PCR VERSION HISTORY

Version Number	Amendments	Date Issued
1	X	07 / 31 / 14

Table of Contents

Page 5

- 1.0 | General Information
- 1.1 | Goal and Scope

Page 6

- 1.2 | EPD Ownership/Responsibility
- 2.0 | Period of Validity
- 3.0 | Definitions

Page 7

- 4.0 | Informed Comparison
- 5.0 | Company/Organization, Product, and Product Category
- 5.1 | Description of Company/Organization
- 5.2 | Definition of Product Category

Page 8

- 5.3 | Description of Product

Page 9

- 6.0 | Requirements for the Underlying LCA
- 6.1 | Functional and Declared Unit
- 6.2 | System Boundaries

Page 12

- 7.0 | Life-Cycle Inventory Analysis
- 7.1 | Data Collection and Description of Data

Page 14

- 7.2 | Cutoff Rules
- 7.3 | Data Quality Requirements

Page 15

- 7.4 | Units
- 7.5 | Allocation Rules



Page 16

8.0 | Impact Categories and Characterization Factors

Page 17

9.0 | Additional Environmental Information

Page 18

10.0 | EPD Supporting Data

Page 19

11.0 | Content of the EPD

Page 20

12.0 | References

1.0 General Information

These product category rules (PCR) have been developed under the general program instructions for ASTM International's Environmental Product Declaration (EPD) Program. The PCR are intended for use by North American organizations and other interested parties for preparing EPDs for Asphalt Shingles and Bituminous Membrane Roofing.

The following key aspects of the referenced Roof Waterproofing PCR, The Norwegian EPD Foundation (EPD-Norge) PCR for "Roof Waterproofing", NPCR 22, make them inappropriate for direct adaptation to the North American situation and for direct use as PCR for North American asphalt shingles and bituminous roofing systems:

- The NPCR requirements are based primarily on the CEN EN15804 standard for a European core PCR, whereas the North American PCR is based primarily on the ISO 14025 and ISO 21930 standards referenced below;
- Technical data and standards listed or referred to are European and not directly applicable to North America; and
- The impact measures listed reflect European characterization models and units of measure rather than those specified in the Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI) system used in North America.

In addition, ASTM International's North American PCR for Single Ply Roofing Membranes, November 2013, was reviewed but was not adapted due to development timing as well as differences in scope of materials, building use type and differing functional units.

1.1 | GOAL AND SCOPE

This PCR document specifies rules, requirements, and guidelines for developing EPDs for Asphalt Shingles and Bituminous Membrane Roofing and underlying requirements of related Life Cycle Analysis (LCAs). These PCR are valid for, and provide requirements for, both Business-to-Business (BtoB) and Business-to-Consumer (BtoC) EPDs. An EPD prepared under these PCR will present data that has been aggregated over some or all of the following phases of the life cycle depending on whether the EPD is BtoB or BtoC:

- raw materials acquisition,
- manufacturing,
- transportation,
- installation,
- use and maintenance, and
- disposal/reuse/recycling.

A reference service life (RSL) shall be stated in a BtoC EPD to take account of the maintenance and replacement impacts over an assumed building service life. A RSL shall be stated for a BtoB EPD if a use phase scenario is included in the EPD. A RSL must be based on a verifiable performance history as per Section 6.2.

These PCR are consistent with and comply with the mandatory requirements contained in the following standards:

- International Organization for Standardization (ISO) 21930: 2007 Building construction — Sustainability in building construction — Environmental declaration of building products.
- ISO 14025: 2006 Environmental labeling and declarations — Type III environmental declarations — Principles and procedures.
- ISO 14044: 2006 Environmental management — Life cycle assessment — Requirements and guidelines.
- ISO 14040: 2006 Environmental management — Life cycle assessment — Principles and framework.
- ISO 15686: 2011 Buildings and constructed assets – Service life planning, Parts – 1, -2, -7 and 8.

While not necessarily complying with the CEN EN15804 standard, it is referenced in Section 12 and has been consulted with regard to selected requirements and presentation details that go beyond or expand on the above-noted ISO standards.

1.2 | EPD OWNERSHIP/RESPONSIBILITY

The producers or group of producers who develop an EPD following these PCR maintain sole ownership and have responsibility and liability for their EPD.

2.0 Period of Validity

This PCR document is effective for five (5) years from the latest date of publication. If after 5 years, relevant changes in the product category or other relevant factors have occurred (for example, LCA methodology), the document will be revised.

An EPD created under these PCR shall be valid for a five (5) year period from the date of issue after which it shall be reviewed and verified. An EPD shall only be reassessed and updated after 5 years, as necessary, to reflect changes in technology or other circumstances that could alter the content and accuracy of the declaration. The process for verification and establishing the validity of an EPD shall be in accordance with ISO 14025 and ISO 21930.

3.0 Definitions

For the purposes of this document, the definitions given in ISO 6707-1, ISO 14025, ISO 14044, ISO 14050, ISO 15686-1, ISO 21930 and the following apply.

Asphalt shingle: a small unit of prepared roofing for installation with similar units in overlapping rows on inclines normally exceeding 25%, factory-produced with one or more layers of felt, impregnated and coated on both sides with asphalt and surfaced with mineral granules or an alternative surfacing material that provides protection for the asphaltic coating.

Built-up bituminous membrane roofing (BUR): a continuous, semi-flexible roof membrane, consisting of multiple factory-produced sheets manufactured from saturated or coated felt or fiberglass mat, assembled in place with alternate layers of roofing-grade asphalt, and surfaced with mineral aggregate, bituminous materials, a liquid-applied coating or a granule-surfaced cap sheet.

Modified bituminous membrane roofing: a continuous, semi-flexible roof membrane, consisting of one or more factory-produced sheets manufactured with asphalt, polymer modifiers, reinforcements, and, if applicable, mineral surfacings. Polymer modifiers include primarily atactic polypropylene (APP)

and styrene butadiene styrene (SBS). Reinforcements include polyester and/or fiberglass mat. Factory-applied surfacings include ceramic-coated or slate granules and metal or polymer foils.

Underlayment: one or more layers of felt, sheathing paper, nonbituminous-saturated felt or other material over which asphalt shingles are applied.

4.0 Informed Comparison

EPDs may enable comparison between products but do not themselves compare products, as stated in ISO 14025 Sections 4 and 6.7.2. It shall be stated in EPDs for building products created using these PCR that only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product RSL relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products. The basis of a comparison shall include the product application in accordance with ISO 21930 and clearly defined and justified scenarios for modules A4, A5, B1-B7 and C1-C4 (see Figure 1).

EPDs based on cradle-to-gate information modules shall not be used for comparisons unless comparisons are made in a building context using a functional unit and complying with all of the requirements set out in ISO 14025, section 6.7.2. EPDs based on a declared unit shall not be used for comparisons.

These PCR cover BtoB and BtoC EPDs. If an EPD is only BtoB, then the following shall be stated in the EPD: This EPD covers only the cradle-to-gate impacts of Asphalt Shingles and Bituminous Roofing using a declared unit and the results cannot be used to compare between products.

5.0 Company/Organization, Product, and Product Category

5.1 | DESCRIPTION OF COMPANY/ORGANIZATION

The name of the company/organization as well as the place(s) of production of finished product shall be provided in the EPD. The EPD may also include general information about the company/organization such as the existence of quality systems, an environmental management system according to ISO 14001, or any other environmental management system in place.

5.2 | DEFINITION OF PRODUCT CATEGORY

These PCR address the specific Asphalt Shingles and Bituminous Roofing produced from the products shown in Table 1, which also shows the standards that provide detailed descriptions and specifications for each product. The most current revision of the specifications listed in the table applicable to the specific product is to be used.



TABLE 1: Asphalt Shingles and Bituminous Membrane Roofing Products

Product	Description/Specification
Asphalt Shingles	ASTM D3018, ASTM D3462, ASTM D226, ASTM D4869, ASTM D6757, ASTM D1970 (together or in combination); CSA A123.5, CSA A123.3, CSA A123.22 (together or in combination); ICC-ES AC438, ASTM D226, ASTM D4869, ASTM D6757, ASTM D1970 (together or in combination)
Built-up Asphalt Membrane Roofing	ASTM D4601, ASTM D4897, ASTM D2626, ASTM D2178, ASTM D3909, ASTM D41, ASTM D312, ASTM D6152, ASTM D4586, ASTM D3747, ASTM D1863 (together or in combination); CSA A123.2, CSA A123.3, CSA A123.4, CSA A123.16, CSA A123.17 (together or in combination), CSA A123.23, UL55A, ASTM D226
Atactic-Polypropylene (APP) Membrane Roofing	ASTM D6222, ASTM D6223, ASTM D6509 CGSB 37-GP-56M
Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing	ASTM D6162, ASTM D6163, ASTM D6164, ASTM 6298, ASTM D7505, ASTM D7530, CSA A123.23, CGSB 37-GP-56M

5.3 | DESCRIPTION OF PRODUCT

The EPD shall provide a narrative description of the product that will enable the user to clearly and unambiguously identify the product. This description shall include, where relevant:

- Product identification by brand name, material type, and simple visual representation, which may be by photograph or graphic illustration;
- The appropriate and most current ASTM, ANSI, ICC-ES, UL, CSA or other product specifications including pertinent physical properties and technical information (for example, fire resistance standards that are met);
- Details regarding product reinforcement type, thickness and color;
- Flow diagram illustrating main unit processes by life-cycle stage according to the scope of the declaration; and
- Materials and substances to be declared.

Material contents of the finished building product, including packaging, shall be declared in terms of the main components. Substances officially classified as hazardous according to relevant national or international regulations shall be stated. Product-specific data that is confidential because of the competitive business environment, intellectual property rights, or similar legal restrictions need not be declared except where such data involves regulated hazardous substances, which must always be disclosed.

6.0 Requirements for the Underlying LCA

The underlying LCA shall be conducted in accordance with ISO 14040 and ISO 14044.

6.1 | FUNCTIONAL AND DECLARED UNIT

The functional unit of a product provides the quantitative normalization for comparing products of equivalent function (functional unit) or equivalent specification. A functional unit is defined for EPDs covering the complete cradle-to-grave life cycle or the cradle-to-gate life cycle with a use stage scenario.

A declared unit is defined for EPDs covering only the cradle-to-gate or cradle-to-gate plus end-of-life stages (see Section 6.2). If the intended use of the EPD is for comparison purposes between different building products, the entire life cycle shall be included, including the use and end-of-life stages. In such situations the functional unit shall be used as the reference, not the declared unit.

For Asphalt Shingles and Bituminous Membrane Roofing, the declared unit shall be 1 m² [10.8 ft²]. A weighted average thickness or other applicable aspects of the product shall be stated when the EPD deals with a generic or representative product group with different thicknesses. The weights shall reflect the relative production volumes for the relevant materials.

The functional unit shall be 100 m² [1076.4 ft²] of constructed area using the product, including all layers required to achieve the expected performance. Explanation of the selected functional unit shall be stated clearly, including the reference service life, installation methods and all ancillary materials such as ballasting, fasteners and adhesives.

The reference service life shall refer to the declared technical and functional quality of the product in the building. It shall be established in accordance with the ISO 15686-1, -2, -7, and -8 standards.

6.2 | SYSTEM BOUNDARIES

Figure 1 shows the life-cycle stages and individual modules that shall be included within the LCA system boundary, depending on whether the EPD is BtoB or BtoC.

FIGURE 1 Life-Cycle Stages and Modules

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE			
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4

Cradle-to-Gate or “Information Module” (BtoB EPDs) | The life-cycle activities and related processes shall include modules A1, A2, and A3—the production stage—as defined below, with scenarios for other life-cycle stages as appropriate.

Cradle-to-Grave (mandatory for BtoC EPDs) | A complete cradle-to-grave LCA shall be developed for the product, including all life-cycle stages and modules, for a specified defined function and service life, inclusive of maintenance and replacement and end-of-life effects.

The system boundaries for both cradle-to-gate and cradle-to-grave LCA include the average transportation of major inputs to (and within) each life-cycle stage. The cradle-to-grave LCA also includes shipment of products to building site locations by common modes as well as average transportation to a landfill or other disposition at the end of the service life for each application.

Any site-generated energy and purchased electricity shall be included in the system boundary. The extraction, processing, and delivery of purchased primary fuels, for example, natural gas and primary fuels used to generate purchased electricity, shall also be included within the boundaries of the system. The sources for purchased electricity for the production stage will be based on published U.S. and/or Canadian government sources for regional grids that are either self-sufficient or net exporters, if available. If the relevant grid is not in either category the grid fuel mix shall include the next largest NERC (North American Electric Reliability Corporation) region or regional averaged grid mix values for the major East, West and Texas grids that are not connected. The North American average grid mix shall be used for the construction and use stages if the use location is not known, as may be the case for industry average or brand-specific average EPDs involving widely dispersed plants. The sources for electricity (calculation procedure) shall be documented.

In the case of Asphalt Shingles and Bituminous Membrane Roofing the following are factors to be taken into account for each life-cycle stage.

Modules A1-A3, the Production Stage:

- Extraction and processing of raw materials, including fuels used in product production;
- Average or specific transportation of raw materials (including recycled materials) from extraction site or source to manufacturing site (including any recovered materials from source to be recycled in the process) and including empty backhauls, and transportation to interim distribution centers or terminals;
- Manufacturing of the product including all energy and materials required and all emissions and wastes produced;
- Packaging, including transportation and waste disposal, with product ready for shipment;
- If packaging is purchased from multiple suppliers, then a weighted average of the transportation distances by mode from all suppliers shall be included in the LCA modeling;
- Average or specific transportation from manufacturing site to recycling/reuse/landfill for pre-consumer wastes and unutilized by-products from manufacturing, including empty backhauls; and
- Recycling/reuse/energy recovery of pre-consumer wastes and by-products from production.

Modules A4-A5, the Construction Stage:

- Average or specific transportation of product from manufacturing site to building site, including empty backhauls;

- Installation on the building site including all ancillary materials taking into account specific application methodology or methodologies; and
- Waste produced on the building site.

Modules B1-B7, the Use Stage | Modules B1-B7 are treated as a typical scenario, which shall be described in detail:

- Reference service life of the building shall be assumed to be 60 years and the maintenance regime and number of replacements of the building product shall be declared accordingly (note that an assumed 60-year reference service life for the building is an accepted time period for the purpose of comparative analysis);
- Include any maintenance/replacement of the building product required to attain the reference service life of the building;
- Maintenance/replacements are to be modeled according to manufacturers' guidelines regarding the reference service life of the product, which must be based on a verifiable product performance history;
- When the product reference service life is less than the assumed building service life (60 years), the aggregated product stage, construction process stage, maintenance and repair during the RSL and end of life stage impacts (modules A1–A5, B2-B3 and C1–C4) associated with the number of changeovers necessary to equal the service life of the building shall be included. When the product service life is greater than the building service life, the initial production impacts shall be fully calculated and shall not be discounted to reflect the remaining product service life;
- When the reference service life of a building product is less than the assumed building service life (60 years) the number of replacements that will be necessary to fulfill the required performance and functionality over the building service life shall be identified. The combined impacts of the originally product and any replacements shall be determined by dividing the building service life by the service life of the product, and the impacts multiplied by the result. For example, if the expected service life of a component is 25 years, the impacts would be multiplied by 2.40, thus normalizing the changeovers to be equivalent to the assumed 60-year building service life; and
- Any energy or water use required for operation or use of the product shall be included.

Modules C1-C4, the End-of-Life Stage | Modules C1-C4 are treated as a typical scenario, which shall be described in detail:

- Dismantling/demolition;
- Average or specific transport from building site to recycling/reuse/landfill, including empty backhauls; and
- Disposal.

All assumptions from LCA shall be described in detail.

LCA results for production, installation, use, and end-of-life stages shall be declared separately in the EPD.

Any transportation data other than identified above shall be indicated. If transportation information is included in other stages than indicated, or if no transportation information exists and assumptions are made, this should be noted.

Summary of EPD Types and Related Requirements

Table 2 summarizes the unit and reference service life requirements by life cycle stages and related modules.

TABLE 2 Unit and Reference Service Life Requirements

EPD-Type	Life Cycle Stages and modules	Declared unite (DU) or functional Unit (FU)	Reference Service Life (RSL)	Primary audience
Cradle to shipping gate	Product stage; modules A1 to A3	DU	Not specified	BtoB
Cradle to building	Product and construction stages; modules A1 to A5	DU	Not specified	BtoB
Cradle to building-with EOL stage	Product, construction and EOL stages; modules A1 to A5 and C1 to C4	DU	Not specified	BtoB
Cradle to building-with use stage	Product, construction and use stages; modules A1 to A5 and B1 to B5	FU	RSL is required	BtoB
Cradle to grave	Product, construction, use and EOL stages; modules A1 to C4	FU	RSL is required	BtoB and/or BtoC

Excluded from System Boundary | A summary of items that may be excluded in the primary product stages include:

- Production, manufacture, and construction of manufacturing capital goods and infrastructure;
- Production and manufacture of membrane production equipment, delivery vehicles, and laboratory equipment;
- Personnel-related activities (travel, furniture, and office supplies); and
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location.

7.0 Life-Cycle Inventory Analysis

7.1 | DATA COLLECTION AND DESCRIPTION OF DATA

The data shall be representative according to temporal, geographical, and technological requirements.

Temporal | The obtained information from the manufacturing process should be annual values, preferably from the previous twelve-month period or calendar year. Average background or secondary data shall not be older than ten years unless accompanied by a statement attesting to the validity of older data.

Geographical | The geographic region of the relevant life-cycle stages included in the calculation of representative data shall be documented.

Technological | Data shall represent technology in use.

The use of specific or generic background data shall be documented. The following distribution will be applied:

- Extraction or production or both of raw materials (specific or average background or both);
- Manufacturing of the product (specific);
- Data sources and any calculation procedures for the fuel mix for electricity generation shall be documented;
- Hazardous waste shall be reported according to applicable U.S and/or Canadian federal or state/provincial regulations as appropriate;
- If EPDs for upstream products are not available, or are not in conformance with ISO 14025 section 7.2.5, data from the best available published literature shall be permitted to be used; and
- If multiple suppliers are used for one material, then a weighted average, based on volume or mass, shall be used to assign transport distance and mode.

For generic data, national databases shall be used to the extent that they are applicable (for example, U.S. Life Cycle Inventory Database, www.nrel.gov/lci). If appropriate national data is not available, sources for similar technology adjusted for national boundary conditions (for example, energy mix) may be used.

All data sources shall be specified, including database and year of publication (reference). Sources of data for transport models (including transport mode, distances, and quantities to be transported) and thermal energy production shall be documented. Where proxy data is used in the absence of specific data for chemicals or other inputs, the source and justification for selection of the proxies shall be documented in the LCA report.

When preparing a company-average EPD for an identical product manufactured at multiple facilities, the LCI data for each site shall be weighted to determine a company average. Weighting shall be by product production. Data reported in the declarations shall be as production-weighted averages of multiple facilities.

The product content will be described in the declaration. Product specific data that is confidential because of the competitive business environment, intellectual property rights or similar legal restrictions need not be declared. In such cases, a notation that the information is confidential will be made along with the description of the function of the component.

In the case of BtoC EPDs, the amount of material and all layers required to achieve the function used as input to enable the product to meet the functional unit requirements shall include related accessories and other materials (that is, ancillary materials) unless the reason for the omission of these is explained.

7.2 | CUTOFF RULES

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA and information modules and any additional information are intended to support an efficient calculation procedure. They shall not be applied in order to hide data. Any application of the criteria for the exclusion of inputs and outputs shall be documented. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices shall be documented.

The cutoff criteria for flows to be considered within the system boundary are as follows in case of insufficient input data or data gaps for a unit process:

Mass | If a flow is less than 1% of the cumulative mass of the model flows, it may be excluded, provided its environmental relevance is minor.

Energy | If a flow is less than 1% of the cumulative energy of the system model, it may be excluded, provided its environmental relevance is minor.

Environmental relevance | Material and energy flows known to have the potential to cause significant emissions into air, water, or soil related to the environmental indicators of these PCR shall be included even if such flows meet the above criteria for Mass and Energy.

At least 95% of the energy usage and mass flow shall be included and the life-cycle impact data shall contain at least 95% of all elementary flows that contribute to each of the declared category indicators.

A list of hazardous and toxic materials and substances shall be included in the inventory and the cutoff rules do not apply to such substances.

7.3 | DATA QUALITY REQUIREMENTS

Any secondary data source used in the underlying life-cycle inventory shall be complete and representative of the applicable North American region in terms of its geographic and technological coverage and of a recent vintage, which is typically less than ten years old. Any deviations from these requirements for secondary data shall be documented, and the following apply:

- All data shall be accurate and representative of the production process, current technology, and current measurement capability.
- The information obtained from the manufacturing process shall be annual average values.
- Average background data shall not be older than 10 years for industry average data or 5 years for producer specific data, unless justification is provided.
- When the owner of the EPD is not the owner of all upstream processes, the owner shall contact his suppliers within the system boundary. If the suppliers do not supply data, the owner shall use the best-available data in the literature based on data quality requirements of this PCR.
- Data shall be identified as direct (for example, measurements or purchasing records), indirect (based on calculations), estimated, or other.

7.4 | UNITS

SI units shall be used with conversions as shown in the table below as necessary. Preferred power and energy units are as follows:

- kWh or MJ for electric energy
- kW or MW for power

TABLE 3: Conversion Factors to be Used if Reporting in IP Units (Imperial)

Convert from	To	Multiply by
Square meter (m ²)	Square foot (ft ²)	1.076391E+01
Kilogram (kg)	Pound (lb)	2.204622
Mega joule (MJ)	British Thermal Unit (BTU)	9.478170E+02
Degree Celsius (°C)	Degree Fahrenheit (°F)	(°C * 9/5) + 32
Cubic meter (m ³)	Cubic foot (ft ³)	3.531466E+01
Meter (m)	Foot (ft)	3.281
m ² K/W	ft ² Fhr/BTU	5.6783
Metric tonne	Ton	1.102

Source: NIST: <http://physics.nist.gov/Pubs/SP811/appenB9.html>; <http://www.nist.gov/pml/wmd/metric/temp.cfm>; and <http://www.nist.gov/pml/wmd/metric/common-conversion-b.cfm>

7.5 | ALLOCATION RULES

In a production process in which more than one type of product is generated, it is necessary to allocate the environmental flows (inputs and outputs) from the process to the different products to get product-based inventory data. Allocation, if required, shall follow the requirements and guidance of ISO 14044:2006, Clause 4.3.4.

Recycled and recovered materials shall be considered raw materials. Only the materials, water, energy, emissions and other elemental flows associated with collecting, reprocessing, handling, sorting and transportation from the point of collection through the generating industrial process to their use in the production process need to be considered. Any allocations before reprocessing shall be allocated to the original product. Recycled and recovered materials, with fuel content and used as fuels, such as used tires, shall be considered alternative energy.

Energy forms used as feedstock to produce materials (for example, plastic) shall be allocated to material resources (kg), while process energy shall be allocated to energy resources (MJ).

Allocation related to transport shall be based on the mass of transported product.

When a product's original function is no longer needed or possible, the product can be processed further in a waste management system. For example, it can be recycled, reused, or energy recovered. Emissions from downstream recycling or combustion after the end-of-waste state will be allocated to the new downstream products, such as heat and electricity. In the case of incineration of wastes for energy

production at the primary production site, the combustion emissions shall be allocated to the building product unless the energy is exported.

Recycling processes should be treated as closed loop recycling, as long as no change occurs in the inherent properties of the recycled material. In such cases, the need for allocation is avoided since the use of secondary material displaces the use of virgin (primary) materials.

If different allocation options are relevant and a deviation of greater than 20% is a foreseen outcome, a sensitivity analysis shall be initiated. These different allocation approaches and data sets shall be documented and declared.

8.0 Impact Categories and Characterization Factors

Environmental impact category indicators shall be taken from Table 4 for declaring environmental aspects in accordance with ISO 21930:2007, Section 8.2 and ISO 14044:2006.

TABLE 4: Declaration of Environmental Category Indicator Results, Use of Resources, and Generation of Waste

Category Indicator	Unit
Global warming potential (GWP)	kg CO ₂ equiv
Acidification potential	kg SO ₂ equiv
Eutrophication potential	kg N equiv
Smog creation potential	kg O ₃ equiv
Ozone depletion potential	kg CFC-11 equiv
Total primary energy consumption	
Nonrenewable fossil	MJ (HHV)
Nonrenewable nuclear	MJ (HHV)
Renewable (solar, wind, hydroelectric, and geothermal)	MJ (HHV)
Renewable (biomass)	MJ (HHV)
Material resources consumption	
Nonrenewable material resources	kg
Renewable material resources	kg
Net fresh water (inputs minus outputs)	L
Non-hazardous waste generated	kg
Hazardous waste generated	kg

Notes for Table 4:

1. The impact categories of Life Cycle Impact Assessment (LCIA) shall be calculated using characterization factors specified in version 2.1 of US EPA TRACI (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts). <http://www.epa.gov/nrmrl/std/traci/traci.html>

2. Fresh water is naturally occurring water on the earth's surface and underground as groundwater in aquifers and underground streams. The term specifically excludes seawater and brackish water.
3. Recovered or recycled materials are neither non-renewable nor renewable resources under ISO definitions. The use of such materials can be reported as Additional Environmental Information as per clause 9.
4. Primary energy is an energy form found in nature that has not been subjected to any conversion or transformation process. Examples of primary fuels are coal, natural gas and biomass. Alternative energy is recovered from previous use or wastes. Examples are solvents, tires, oil, and animal fat.
5. Recycled and recovered materials with fuel content and used as fuels, such as used tires, shall be considered alternative energy.

9.0 Additional Environmental Information

An EPD shall include, where relevant, additional information such as given the points below, related to environmental issues, other than the environmental information derived from LCA, LCI, or information modules and other than emissions to water and to indoor air. This information shall be separated from the information described in ISO 21930, 8.2.2 and 8.2.3.

- Information on environmental issues, such as:
 - Impact(s) and potential impact(s) on biodiversity,
 - Toxicity related to human health or the environment or both, and
 - Geographical aspects relating to any stages of the life cycle (for example, a discussion on the relation between the potential environmental impact(s) and the location of the product system);
- Data on building product performance, including effects on building operating energy use, if environmentally significant;
- Organization's adherence to any environmental management system, with a statement on where an interested party may find details of the system;
- Any other environmental certification program applied to the building product and a statement on where an interested party may find details of the certification program;
- Other environmental activities of the organization, such as participation in recycling or recovery programs, provided details of these programs are readily available to the purchaser or user and contact information is provided;
- Information that is derived from the LCA but not communicated in the typical LCI- or LCIA-based formats;
- Instructions and limits for efficient use;
- Hazard and risk assessment on human health and the environment;
- Information on absence or level of presence of a material in the building product that is considered of environmental significance in certain areas (see ISO 14021:1999, 5.4 and 5.7);
- Preferred waste management option for used building products; and
- Potential for incidents that can have impact(s) on the environment such as recycled content or recycling rates.

Additional information shall only be related to environmental issues. Information and instructions on product safety unrelated to the environmental performance of the building product shall not be part of a Type III environmental declaration.

10.0 EPD Supporting Data

A project report shall be prepared in accordance with the requirements and guidance of ISO 14044:2006, Clause 6, for third-party reports. This information shall document the LCA study and additional environmental information in a systematic, comprehensive way, and shall be made available to the verifier in order to demonstrate that the requirements of this PCR document and ISO 21930 “Environmental declaration of building products” have been met. The project report shall include, where relevant:

- The commissioner of the report, the contact information of the report author, and the date of the report;
- The input and output environmental data of the unit processes that are used for the LCA calculations;
- The documentation (measurements, calculations, estimates, sources, correspondence, traceable references to origin, and so forth) that provides the basis from which the process data for the LCA is formulated;
- The specification used to create the manufacturer’s products;
- Energy consumption figures;
- Emission data to air, water, and soil;
- Waste production;
- Data that demonstrates that the information is complete – in specific cases, reference can be made to, for instance, standards or quality regulations;
- Referenced literature and databases from which data have been extracted;
- Data used to carry out sensitivity analyses;
- Documentation that demonstrates that the building products can fulfill the desired function(s) and performance;
- Documentation that demonstrates that the chosen processes and scenarios in the flow chart satisfy the requirements set in ISO 21930;
- Documentation that substantiates the chosen life cycle of the building products;
- Documentation and substantiation of the percentages or figures used for the calculations in the end-of-life stage;
- Documentation and substantiation of the percentages and figures (number of cycles, prices, and so forth) used for the calculations in the allocation procedure;
- Information showing how averages of different reporting locations have been calculated to obtain generic data;
- Documentation used to substantiate any qualitative information in the additional environmental information;
- Procedures used to carry out the data collection (questionnaires, instructions, informative material, confidentiality agreements, and so forth);
- The characterization factors used;

- The criteria and substantiation used to determine the system limits and the selection of input and output flows;
- Documentation that demonstrates consistency when using information modules; and
- Documentation used to substantiate the other choices and assumptions.

11.0 Content of the EPD

The following demonstration of verification shall be completed and included with the EPD. Note that third-party verification is optional for BtoB EPDs, but mandatory for BtoC EPDs.

Demonstration of Verification

PCR review, was conducted by: < name and organization of the chair, and information on how to contact the chair through the programme operator >
Independent verification of the declaration and data, according to ISO 14025: internal external
(Where appropriate ^{a)}) Third party verifier: <name of third party verifier>
Optional for business to business communication, mandatory for business to consumer communication.

All Type III environmental declarations in a product category shall follow the format and include the parameters as identified in this PCR. The following general information shall be declared in the EPD:

Name and address of the manufacturer(s);

- Product identification by name (including, for example, production code) and a simple visual representation of the product;
- Description of the building product's use and the functional or declared unit of the product to which the data relates;
- Description of the application (installation) of the building product where relevant;
- Detailed list of the substances, by weight, that make up the building product;
- Data from LCA or LCI or information modules as per ISO 14025, clause 7.2.2;
- Additional environmental information (see Section 9);
- Statement of whether the EPD is cradle to gate or cradle to grave;
- Statement that EPDs from different programs (using different PCR) may not be comparable;
- Statement that the EPD represents an average performance in cases where an EPD declares an average performance for a number of products, with the standard deviation of the product's performance with respect to the average stated;

- Information on where explanatory material may be obtained;
- Diagram of the life-cycle stages included in the LCA subdivided into production, construction, use and end-of-life stages, and system boundaries;
- When the EPD includes the use stage, a description of the nature of the processes and ancillary materials that are required for installing the building product in the building or other type of construction works and their replacement and maintenance according to the cutoff criteria;
- Name of the program and the program operator's address and, if relevant, the logo and website URL;
- Identification of the PCR document on which the EPD is based;
- Date the EPD was issued and period of validity;
- Site(s), manufacturer, or group of manufacturers or those representing them for whom the results of the LCA are representative;
- Name of PCR review panel chair;
- Whether the independent review of the EPD and data was conducted by an internal or external verifier (third-party verification is mandatory for BtoC EPDs);
- Name, address, phone number, fax number, and e-mail of the third-party verifier and logo of the verification body, if applicable; and
- ISO 14025:2006 9.2.2 states that, "Type III environmental product declarations intended for business-to-consumer communication shall be available to the consumer at the point of purchase.

12.0 References

ISO Standards:

ISO 6707-1: 2014 Buildings and civil engineering works — Vocabulary -- Part 1: General terms

ISO 14021: 1999 Environmental labels and declarations — Self-declared environmental claims (Type II environmental labeling)

ISO 14025: 2006 Environmental Labeling and Declarations — Type III Environmental Declarations
Principals and Procedures

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

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

ISO 15686: 2011 Buildings and constructed assets — Service life planning, Parts -1, -2, -7 and -8

ISO 21930: 2007 Sustainability in Building Construction — Environmental Declaration of Building Products

Other references:

ASTM PCR001 – Single Ply Roofing Membranes; November 2013

ASTM D41, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

- ASTM D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- ASTM D312, Standard Specification for Asphalt Used in Roofing
- ASTM D1079, Standard Terminology Relating to Roofing and Waterproofing
- ASTM D1863/D1863M, Standard Specification for Mineral Aggregate Used on Built-Up Roofs
- ASTM D1970/D1970M, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- ASTM D2178/D2178M, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
- ASTM D2626/D2626M, Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing
- ASTM D3018/D3018M, Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules
- ASTM D3462/D3462M, Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
- ASTM D3747, Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation
- ASTM D3909/D3909M, Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced With Mineral Granules
- ASTM D4586/D4586M, Standard Specification for Asphalt Roof Cement, Asbestos-Free
- ASTM D4601/D4601M, Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- ASTM D4869/D4869M, Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing
- ASTM D4897/D4897M, Standard Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing
- ASTM D6152/D6152M, Standard Specification for SEBS-Modified Mopping Asphalt Used in Roofing
- ASTM D6162, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
- ASTM D6163, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
- ASTM D6164/D6164M, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements
- ASTM D6222/D6222M, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements
- ASTM D6223/D6223M, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous

Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements

ASTM D6298, Standard Specification for Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface

ASTM D6509/D6509M, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements

ASTM D6757, Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing

ASTM D7505/D7505M, Standard Specification for Self-Adhesive Polyester Fabric Reinforced Polymer Modified Asphalt Steep Slope Roll Roofing Surfaced with Mineral Granules

ASTM D7530/D7530M, Standard Specification for Self-Adhesive Glass Fiber Fabric Reinforced Polymer Modified Asphalt Steep Slope Roll Roofing Surfaced with Mineral Granules

Athena Sustainable Materials Institute, Life Cycle Analysis of Residential Roofing Products, March 2000

Athena Sustainable Materials Institute, Life Cycle Analysis of Asphalt Impregnated Fiberglass BUR Felts, March 2001

Athena Sustainable Materials Institute, Life Cycle Inventory for Road and Roofing Asphalt, March 2001

Bitumen Waterproofing Association, Environmental Declaration for Bitumen Roof Waterproofing Systems, February 2013

CAN/CSA-A123.2, Asphalt-Coated Roofing Sheets

CAN/CSA A123.3, Asphalt Saturated Organic Roofing Felt

CAN/CSA-A123.4, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems

CAN/CSA A123.5, Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules

CAN/CSA-A123.16, Asphalt-Coated Glass-Base Sheets

CAN/CSA A123.17, Asphalt Glass Felt Used in Roofing and Waterproofing

CAN/CSA A123.22, Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

CAN/CSA A123.23, Modified Bitumen Roof Membranes (under development)

CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing

EN 15804, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products, January 2012

ICC-ES AC438, Acceptance Criteria for Alternative Asphalt Roofing Shingles

UL55A, Materials for Built-Up Roof Coverings