Product Category Rule
for Environmental Product Declarations

PCR for Residential Countertops

NSF Sustainability℠
National Center for Sustainability Standards

Program Operator

NSF International

National Center for Sustainability Standards

Valid through September 17, 2018

Extended per PCRext 2021-103 valid through September 17, 2021

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

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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 innovative support to private industry, trade associations, government and academia to foster a consensus-based approach toward conformity assessment in the sustainability field. Visit http://www.nsfsustainability.org or contact ncss@nsf.org.

To initiate an LCA, receive an EPD verification, or ask questions on where to start, contact NSF Sustainability at sustainability@nsf.org or 734-476-2543.

1 GENERAL INFORMATION

This Product Category Rule (PCR) applies to products that provide the function of residential countertops. Other functions the product may provide are not considered herein. This PCR includes residential countertops made from the following material types: concrete, engineered stone, glass, high pressure decorative laminate (HPL), natural stone (i.e., granite, marble), polymeric solid surface, or porcelain. Any of these material types may contain recycled content.

This PCR is valid through September 17, 2018.
This PCR validity period has been extended through September 17, 2021 per PCRext 2021-103.

1.1 United Nations Standard Products and Services Code

Product coding is used to classify goods and services. The UNSPSC (United Nations Standard Products and Services Code) is a taxonomy of products and services for use in eCommerce. The UNSPSC coding system replaces the UNCCS (United Nations Common Coding System) from November 5, 2012 onwards. The UNSPSC is a five-level hierarchy coded as an 8-digit number. According to ISO 14025 and the PCR Guidance document, in order to assist with referencing EPDs to PCRs, a code set is recommended. Using the UNSPSC codeset, the following countertop products are included (but not limited to):

- 30162200 Countertops
- 30162201 Laminate countertop
- 30162202 Cultured marble countertop
- 30162203 Solid surface countertop
- 30162204 Granite countertop

1.2 Definition of countertop material types

concrete: Primarily aggregate (e.g., glass, porcelain, shell, etc.), cement, and water, pre-cast into a slab or sheet.

engineered stone: Greater than 90% quartz crystals mixed with polymer resin and consolidated under heat and pressure.

glass: 100% glass fused or cast into slabs or panels.

high pressure decorative laminate (HPL): 70% (nominal) wood based paper, impregnated with melamine and/or phenolic resin and consolidated under high heat and pressure to form a solid sheet.

natural stone: Typically granite or marble cut into sheets or slabs.

polymeric solid surface: Thermoset resins such as acrylic, polyester or a blend, cast into a sheet.

porcelain: A ceramic material made by heating materials, generally including clay in the form of kaolin, and other fine powder aggregates, to high temperature.

1.3 Information

This document specifies the requirements for the Life Cycle Assessment (LCA) study, and the format and content of the Environmental Product Declaration (EPD) itself. The boundary of the LCA shall be cradle-to-grave as defined in Section 4, *System Boundary*. It is expected that raw materials may have individual LCAs and PCRs. This PCR is primarily written to address residential countertop construction and/or installation in North America calculating environmental impacts using TRACI[12] (Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts), however CML[7] (Institute of Environmental Sciences of the University of Leiden) impacts may be included as an option. The country of the material origin and/or construction facilities for the product group shall be specified.

This Product Category Rule committee referenced the existing Countertop PCR DRAFT created by The Green Standard for Countertops in September 2009 during the development of this PCR. No record was found that the Green Standard draft was ever finalized. Therefore, this is the first known third-party reviewed PCR for residential countertops.

This PCR document has been prepared by NSF International (the program operator) and the Product Category Rules Committee in accordance with ISO 14025. Outreach to various stakeholders was submitted through email, press release, and website to solicit members to participate in the PCR creation. A multistakeholder group composed of countertop industry manufacturers, sustainability consultants, and LCA representatives collaborated to write the PCR

1.4 Goal and scope requirements for the LCA study

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

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 shall be presented in such a way as to be relevant to the public.

This PCR was not written to support comparative assertions. Even for similar products, differences in functional unit, use and end-of-life stage assumptions, and data quality may produce incomparable results[1]. 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 shall include a description of all of the following according to this PCR:

- functional unit;
- system boundary;
- description of data;
- criteria for inclusion of inputs and outputs (cut off rules);
- data quality requirements; and
- units and quantities.

[1] WRI Product Life Cycle Accounting and Reporting Standard (second draft - English) October 2011 *Copyright © ED World Resources Institute & World Business Council for Sustainable Development, September 2011*<http://wri.org>

2 PRODUCT DESCRIPTION AND CHARACTERISTICS

2.1 Product Description

The product description shall include the name of the product, product manufacturer and/or model number, and general description of the product. Product groups and average products shall be clearly defined. The product, or range of products, shall be identified by the classification of the product and number of functional units that the product represents. The product or range of products shall be sufficient to meet the service life identified in Section 3, *Functional Unit*.

Based on multiple LCAs from industry manufacturers, similar products (i.e., products with different material types, core construction material (wood, plastic, glass, composite), surface treatments, etc.) can be included in the same declaration provided that the range of variation within each impact category does not exceed ± 10% of impact categories listed in Section 8, *Parameters to be Declared in the EPD*.

This PCR is valid for residential countertops in accordance with the standards shown below or as appropriate or applicable:

Concrete

- NSF/ANSI 51, Food Equipment Materials
- ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or [50-mm] Cube Specimens)
- ASTM C293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
- ASTM C642, Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
- ASTM C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

Engineered stone

- NSF/ANSI 51, Food Equipment Materials
- ISFA-3-01 (2013), Classification and Standards for Quartz Surfacing Material
- ISFA-3-02 (2013), Fabrication Standards for Quartz Surfacing Material

Glass

- NSF/ANSI 51, Food Equipment Materials
- ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- ASTM C293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
- ASTM C642, Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
- ASTM C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

High pressure laminate (HPL)

- ANSI/NEMA LD 3-2005, High-Pressure Decorative Laminates (HPDL)

Natural stone

- NSF/ANSI 51, Food Equipment Materials
- ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
- ASTM C99, Standard Test Method for Modulus of Rupture of Dimension Stone
- ASTM C170, Standard Test Method for Compressive Strength of Dimension Stone
- ASTM C1026, Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling

Polymeric solid surface

- NSF/ANSI 51, Food Equipment Materials
- ISFA-2-01 (2013), Classification and Standards for Solid Surfacing Material
- ISFA-2-02 (2013), Fabrication Standards for Solid Surfacing Material
- ISO 19712-1, Classification and specification of solid surfaces
- ISO 19712-2, Classification and specification of sheets
- CSA B45.5-11/IAPMO Z124, Plastic plumbing fixtures

Porcelain

- None provided

2.2 Product Characteristics

The product characteristics shall be described. The basis for the description shall be the appropriate product specifications. Where such standards are not available, equivalent descriptions shall be given.

Concrete

Example:

Characteristic	Nominal value	Unit
thickness		mm (inch)
length		m (feet)
width		mm (inch)
product weight		g/m^2 (oz/ft^2)
substrate type		none/plywood
density		
VOC emissions test method		

Additional characteristics	Test Method
food safety	NSF/ANSI 51, Food Equipment Materials
compressive strength	ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
absorption	ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
hardness/scratch resistance	Mohs Hardness Scratch Resistance
rupture	ASTM C99, Standard Test Method for Modulus of Rupture of Dimension Stone

Engineered stone

Example:

Characteristic	Nominal value	Unit
primary material thickness		mm (inch)
sheet/slab length		cm (inch)
sheet/slab width		cm (inch)
primary material weight		gm/m² (lb/ft²)
underlayment included		Y/N
underlayment type	(state type)	
VOC emissions test method	(state method)	

Additional characteristics	Test Method	
specific gravity	ASTM D792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement	
bulk density	ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone	
density	ASTM C373, Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products	KSF 2530
gloss	Gloss meter	
water absorption	ASTM C373, Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products	
absorption	ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone	
coefficient of linear thermal expansion	ASTM D696, Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatometer	

Additional characteristics	Test Method	
thermal expansion	ASTM E228, Standard Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer	ASTM C531, Standard Test Method for Mean Specific Heat of Thermal Insulation
flexural strength	ASTM C880, Standard Test Method for Flexural Strength of Dimension Stone	EN 14617-2:2008
flexural modulus	ASTM D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials	
modulus of rupture	ASTM C99, Standard Test Method for Modulus of Rupture of Dimension Stone	
bond strength	ASTM C482, Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste	
breaking strength	ASTM C648, Standard Test Method for Breaking Strength of Ceramic Tile	
deflection temperature	ASTM C648, Standard Test Method for Breaking Strength of Ceramic Tile	
boiling water resistance rating	ANSI/NEMA LD 3, 3.5 Boiling Water Resistance	
high temperature resistance rating	ANSI/NEMA LD 3, 3.6 High Temperature Resistance	
thermal shock	ASTM C484, Standard Test Method for Thermal Shock Resistance of Glazed Ceramic Tile	
Mohs hardness	Mohs Hardness Scale	DIN EN 101
slip resistance	ASTM C1028, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method	
compressive strength dry	ASTM C170, Standard Test Method for Compressive Strength of Dimension Stone	
compressive strength wet	ASTM C170, Standard Test Method for Compressive Strength of Dimension Stone	
compressive strength	ASTM C179, Standard Test Method for Drying and Firing Linear Change of Refractory Plastic and Ramming Mix Specimens	EN 14617-15:2005

Additional characteristics	Test Method(s)	
stain resistance	ANSI Z124.6-07[2]	ANSI/NEMA LD 3, 3.4 Stain
colorfastness	ANZI Z124.6.5.1**Error! Bookmark not defined.**	
cigarette test	ANSI Z124.6-07**Error! Bookmark not defined.**	
chemical resistance	ANSI Z124.6-07**Error! Bookmark not defined.**	ASTM C650, Standard Test Method for Resistance of Ceramic Tile to Chemical Substances
impact test	ANSI Z124.6-07**Error! Bookmark not defined.**	
impact strength	2 lb. ball from 8'	
impact strength (Izod)	ASTM C256, Method of Test for Flexural Strength of Magnesium Oxychloride Cements (Using Simple Bar with Two-Point or Single-Point Loading)	
wear and cleanability	ANSI Z124.6	
impact strength	2 lb. ball from 8'	
impact strength (Izod)	ASTM C256, Method of Test for Flexural Strength of Magnesium Oxychloride Cements (Using Simple Bar with Two-Point or Single-Point Loading)	
wear and cleanability	ANSI Z124.6	
fungal resistance	ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi	
bacteria resistance	ASTM G22, Standard Practice for Determining Resistance of Plastics to Bacteria	
rockwell hardness	ASTM D785, Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials	
abrasion resistance	ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser	ASTM C501, Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
abrasive index	ASTM C241, Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic	

[2] Intended to be replaced by CSA B45.5/IAPMO Z124.

Additional characteristics	Test Method(s)	
slip resistance	EN 14231, Natural stone test methods. Determination of the slip resistance by means of the pendulum tester	
flammability	ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials	UL-94, Test for Flammability of Plastic Materials for Parts in Devices and Appliances
smoke density	ASTM E662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials	
freeze-thaw resistance	ASTM C1026, Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling	
deicing	ASTM C672, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals	

Glass

Example:

Characteristic	Nominal value	Unit
thickness	1.25	(inch)
length	7.5	(feet)
width	36	(inch)
product weight	16	(lb/ft^2)
use rating		commercial, residential
substrate type		HDF (high density fiberboard)
density		
VOC emissions test method		

Additional characteristics	Test Method*
food safety	NSF/ANSI 51, Food Equipment Materials
compressive strength	ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
absorption	ASTM C97, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
hardness/scratch resistance	Mohs Hardness Scratch Resistance
rupture	ASTM C99, Standard Test Method for Modulus of Rupture of Dimension Stone

High pressure laminate (HPL)

Example:

Characteristic	Nominal value	Unit
thickness		mm (inch)
length		m (feet)
width		mm (inch)
product weight		g/m^2 (oz/ft^2)
use rating		commercial
substrate type		HDF (high density fiberboard)
density		
VOC emissions test method		

Additional characteristics	Test Method*
appearance	ANSI/NEMA LD 3, 3.1 Appearance
surface finish	ANSI/NEMA LD 3, 3.2 Surface Finish
light resistance rating	ANSI/NEMA LD 3, 3.3 Light Resistance
cleanability rating	ANSI/NEMA LD 3, 3.4 Cleanability
stain rating	ANSI/NEMA LD 3, 3.4 Stain 1-10 ANSI/NEMA LD 3, 3.4 Stain 11-15
boiling water resistance rating	ANSI/NEMA LD 3, 3.5 Boiling Water Resistance
high temperature resistance rating	ANSI/NEMA LD 3, 3.6 High Temperature Resistance
scratch resistance	ANSI/NEMA LD 3, 3.7 Scratch Resistance
ball impact resistance	ANSI/NEMA LD 3, 3.8 Ball Impact Resistance (mm or inch)
dart impact resistance	ANSI/NEMA LD 3, 3.9 Dart Impact Resistance (mm or inch)
radiant heat resistance	ANSI/NEMA LD 3, 3.10 Radiant Heat Resistance (Coil and Strip Methods) (sec.)
dimension change	ANSI/NEMA LD 3, 3.11 Dimensional Change (%)
room temperature dimensional stability	ANSI/NEMA LD 3, 3.12 Room Temperature Dimensional Stability (%)
wear resistance	ANSI/NEMA LD 3, 3.13 Wear Resistance (cycles)
*characteristics according to ANSI/NEMA LD 3 - 2005	

Solid surface

Example:

Characteristic	Nominal value	Unit
primary material thickness		mm (inch)
sheet/slab length		cm (inch)
sheet/slab width		cm (inch)
primary material weight		gm/m² (lbs/ft²)
underlayment included		Y/N
underlayment type		

Additional characteristics	Test Method
fungal resistance	ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
bacterial resistance	ASTM G22, Standard Practice for Determining Resistance of Plastics to Bacteria
consistency of color	ISSFA SST 2.1-00
cleanability/stain resistance	ISSFA SST 3.1-00
visual defects	ISSFA SST 5.1-00
light resistance	ISSFA SST 7.1-00
boiling water resistance	ISSFA SST 8.1-00
high temperature resistance	ISSFA SST 9.1-00
radiant heat resistance	ANSI/NEMA LD 3, 3.10 Radiant Heat Resistance (Coil and Strip Methods) (sec.)

Additional characteristics	Test Method
linear thermal expansion	ASTM E228, Standard Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer (mm./mm./°C)
flexural strength	ASTM D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
flexural modulus	ASTM D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
hardness, barcol	ASTM D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
flatness of sheets	ISSFA SST 4.1-00
impact resistance	ISSFA SST 6.1-00

3 FUNCTIONAL UNIT

The functional unit shall be 1 sq m (10.76 sq ft) for a period of ten (10) years in residential use. The functional unit includes a front edge and a backsplash. The EPD shall provide information for the entire physical product as defined within the system boundaries (see Section 4, *System Boundary*). Exclusions are described in Section 4, *System Boundary*.

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.

4 SYSTEM BOUNDARY

System boundaries are a set of criteria specifying which unit processes are part of a product system. The entire life cycle is to be covered including all industrial processes from raw material acquisition and pre-processing into a countertop pre-form, construction of the countertop, distribution, transportation and installation in end user location, use/maintenance, and end-of-life.

Primary data shall be used for processes under the operational control of the reporting organization. (Operational control is defined as any facility that the reporting organization has control over or an operation, if it has the full authority to introduce and implement its operating policies at the operation.) Primary data shall also be used for all other processes when available. When primary data is not available, secondary data may be used for processes that occur in facilities outside of the control of the reporting organization.

Specifically excluded from the system boundary are the production of capital equipment (including facilities) to make the product, infrastructure, plumbing fixtures, cook tops, sinks (stand alone and integrated (unless the sink is cast simultaneously with the countertop e.g., cast polymer)), and personnel related activities unless specifically shown to be relevant. Also excluded is the recycling of materials as these are accounted for in the next life cycle. Recycling is described in detail in Section 5, *Allocation Rules*.

A system boundary flow chart example is shown on the next page.

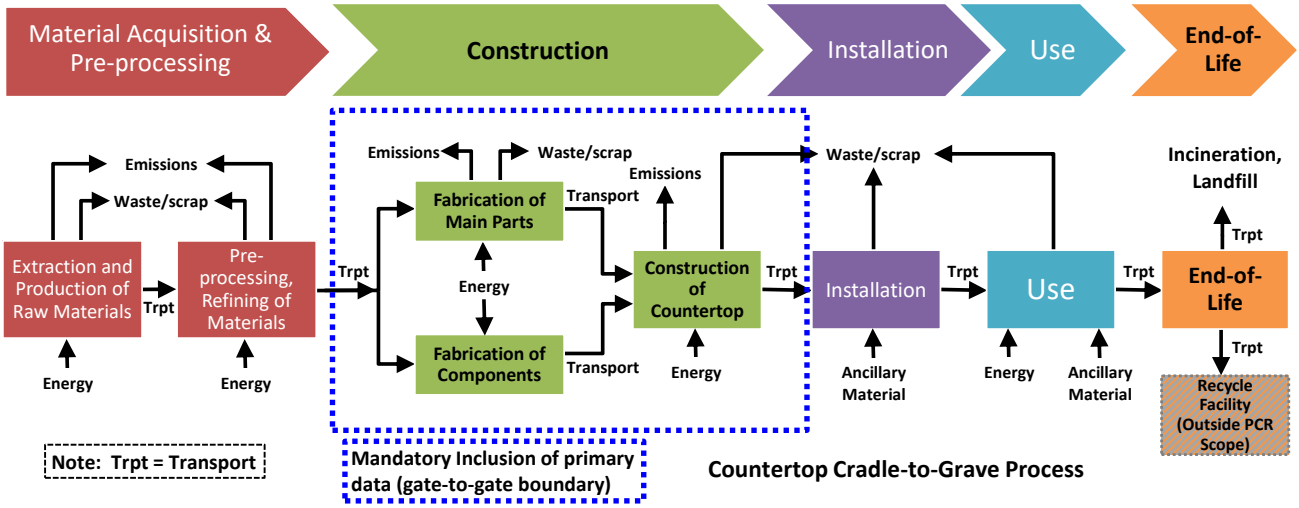

Figure 1: System Boundaries, example flow

4.1 System boundary definitions

4.1.1 Material acquisition and pre-processing stage

The material acquisition, pre-processing, and intermediate processing stage start when the material is extracted from nature, or recovered from previous use, and ends when the material reaches the gate of the countertop construction facility. Materials can be considered either “primary” or “secondary”.

— Primary materials are extracted from nature and are used to create basic materials used in the construction of a countertop (e.g., HPL, solid surface, glass). Transportation of materials shall be included in the life cycle impact assessment.

— Secondary materials are recovered, reclaimed, or recycled content that are used to create basic materials used in the construction of a countertop. Transportation of materials shall be included in the life cycle impact assessment.

— Primary processing is the conversion of materials to a bulk form or a generic shape (e.g., solid surface sheets, or HPL consolidation).

— Intermediate processing is the conversion of materials to components (e.g., particleboard, plastic pellets for edgebanding, steel coil/sheet, etc.).

For the material extraction and primary/intermediate processing stage the boundary ends when the component reaches the gate of the construction stage. Transportation within and between all processing stages shall be included in the life cycle impact assessment.

Waste and scrap created during raw material acquisition and pre-processing, and emissions associated with transporting the material to recycling or landfill centers shall be accounted for in the EPD. Primary data for this stage shall be used, if available, otherwise secondary data shall be used.

Secondary data shall be used for industry processes and may come from the USLCI for US based processes, the ELCD database for European based processes, the Japanese LCI (Life Cycle Inventory) database, other relevant national or regional databases, or similarly regionally developed life cycle inventory data. If waste materials are recycled, landfilled, combusted, or composted, the transport distance shall be reported. In the US, the EPA WARM3 model gives an average transport end of life distance as 32 kilometers (20 miles). This value shall be used for US based processes when primary data or other representative data are not available, and when transport distance is not integrated into the dataset.

For material waste not imbedded in software packages, or where primary data does not exist, a 10% scrap rate shall be used for the model and material recycling percentages and rates. The US rate shall be based on US EPA Municipal Solid Waste Generation, Recycling, and Disposal in the United States- Facts and Figures (current version)4; outside the US, a regional or nationally appropriate waste model shall be used.

All transportation, including interfacility transport, prior to the material being shipped to the construction stage shall be included. Transport from the raw material stage to the construction stage shall be included. If using an LCA tool where these transport data are not included or primary data do not exist, transport distances listed in Table 1 shall be used for North American based processes. Transport of the extracted raw materials within the acquisition and pre-processing stage are illustrated in Figure 1. For processes outside of North America, an appropriate regional or national transportation distance and mode(s) shall be used where primary data does not exist. A weighted average transportation distance may also be calculated from primary data. Table 1 below is intended to be used for material transportation associated with the appropriate process flow(s). If more than one transportation method was required, then the usage of multiple transportation datasets shall be reflected in the LCA.

Table 1 materials transport distances, material acquisition, and pre-processing stage to construction stage

Raw Material/ Classification grouping		Distance (miles)		
		Rail	Truck*	Water
Veneer	26 Wood Products	162 miles	332 miles	5982 Miles Picking 5 Ports for an average of **all** water transport (Asia, Australia, Africa, Europe & South America)
Particle Board	26 Wood Products	162 miles	332 miles	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)
MDF	26 Wood Products	162 miles	332 miles	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)
Paper Backer	27 Pulp, newsprint, paper, and paperboard	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge) [837 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code "Table 7"][1]	742 miles	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)
Solid Wood	26 Wood Products	162 miles	332 miles	5982 Miles Picking 5 Ports for an average of **all** water transport (Asia, Australia, Africa, Europe & South America)
Plywood	26 Wood Products	162 miles	332 miles	5982 Miles Picking 5 Ports for an average of **all** water transport (Asia, Australia, Africa, Europe & South America)
Plastic (inc. polymer-based materials; exc. textiles)	24 Plastics & Rubber	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)	757 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 13[2]	960 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]

Raw Material/ Classification grouping		Distance (miles)		
		Rail	Truck*	Water
Steel	32 Base metal in prim. or semifin. forms & in finished basic shapes	562 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]	932 miles	833 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]
Extruded Aluminum	32 Base metal in prim. or semifin. forms & in finished basic shapes	562 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]	932 miles	833 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]
Cast Aluminum	32 Base metal in prim. or semifin. forms & in finished basic shapes	562 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]	932 miles	833 miles in 2007 U.S. DOT Shipment Characteristics by SCTG Code Table 7[1]
Glass	31 Nonmetallic mineral products	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)	126 miles	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)
Fabric Leather	30 Textiles, leather, and articles of textiles or leather	0 miles (NA due to this mode of transport not being significant for this commodity, to our knowledge)	294 miles	5982 Miles Picking 5 Ports for an average of **all** water transport (Asia, Australia, Africa, Europe & South America)

NOTE: The average transport distances could also be used for complete components or units.

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

Table 7[1] and Table 13[2] referenced from:

http://www.bts.gov/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".
*Truck distance listed is round trip, as the assumption is made that the delivery truck returns empty after making the delivery.

4.2 Countertop construction stage

The countertop construction stage starts with the product components entering the countertop construction site and ends with the final countertop leaving the construction gate. This stage is intended to be "gate-to-gate".

Gate-to-gate describes the product boundary encompassing the construction (fabrication and assembly) of the countertop. For purposes of the PCR, the entry gate is the receiving dock of the first facility where basic materials used in the fabrication of the countertop (e.g., laminate, particleboard, adhesive, steel, etc.) begins the conversion to countertop components. The end gate is the shipping dock where the ready-to-install countertop is transported for distribution and/or installation to the end user. The gate-to-gate will include transportation of intermediate materials and components between facilities where more than one physical location is included in the construction process.

Site and gate are used here figuratively, as a product may go through many processes and corresponding intermediate facilities before exiting the construction stage as a final product. During the construction stage, the product undergoes the transformation from intermediate materials, to product component, to semi-finished product, to the final product; additionally, any co-products or wastes formed during production shall be considered in this stage.

Construction includes processes such as:

- transport of components or semi-finished products between processes and/or facilities;
- the following processes shall include the materials and energy use along with the transportation to the point of use:

  - production of the final product by assembling the components or semi-finished products;
  - production of the components or semi-finished product(s);
  - adhesives, catalysts or other ancillary materials used during production;

- sdditional preparation of the final product including bonding, forming, surface treatment, machining, annealing and/or other processes, as appropriate; and
- materials used in packaging of the final product.

Waste and scrap in the construction stage shall be included in the LCA model. Commercially available LCA software programs typically embed these flows in the modeling datasets. The primary data shall be used if it is available. If waste materials are recycled, landfilled, combusted, or composted, the transport distances shall follow the current version of the US EPA WARM Model, currently 20 miles (32 Kilometers) [US EPA Waste Reduction Model (WARM)3] within North America, or another appropriate regionally or nationally applicable model outside North America unless primary data has been obtained, in which case the primary data shall be used.

For waste and scrap in the construction stage not imbedded in software packages modeling datasets, or when no primary data exists, a 30% scrap rate shall be used for the model. The transport distances shall again follow the US EPA Waste Reduction Mode (WARM)[3], currently 20 miles, or other appropriate regionally or nationally applicable model. The amount of waste material sent to landfill versus recycling shall be based on the EPA Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for Durable Goods (current version)[4] within North America, or other appropriate regionally or nationally applicable model for production outside of North America.

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

4.3 Installation stage

The installation stage and, if applicable, the product distribution stage starts with the product leaving the gate of the construction facility and ends when the consumer takes possession of the product. All transportation related to visits to the end user site should be included (e.g., an initial visit to measurement room dimensions, and a second visit to

[3] US EPA Waste Reduction Model http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

[4] Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008 http://www.epa.gov/epawaste/nonhaz/municipal/msw99.htm

deliver and install the countertop). Energy and ancillary materials used during installation should be included. Excluded from installation are sinks (unless an integral part of the countertop), plumbing fixtures, and cook tops.

Most countertops are custom built for the end user; therefore storage and distribution are not typically part of the process. However, in cases where there are several legs of distribution and storage for a product, this stage should include storage at a distribution center and if applicable, a retail location. Product distribution and storage should include processes such as facility operations and transportation between facilities.

Note on installation waste: For countertops in which there are cutouts for cooktops, sinks, 45° corners or excess material at the end of a blank, a 30% scrap shall be used unless there is data to support a different value. This waste material may be created during countertop construction or during installation. The source where the waste was generated and the disposition of the waste should be stated.

4.4 Use and maintenance stage

The use stage begins when the consumer takes possession of the countertop and ends when the countertop is removed at the end-of-life. For countertops, the use phase includes surface cleaning and may include periodic sealing of porous surfaces (e.g., natural stone) or grouting (e.g., porcelain). Details on how to clean, seal or grout the countertop, and well as the frequency, shall be based on the manufacturer's recommendations and shall be documented. All materials and chemicals used for cleaning, sealing, or grouting should be included in the calculation of environmental impacts.

4.4.1 Maintenance and repair

Other than sealing, cleaning, or grouting, maintenance and repair of the countertop is generally insignificant and may be excluded. Countertops routinely perform their designed function until they are replaced for aesthetic rather than functional reasons (e.g., changes in consumer color preferences or replacing the countertop in conjunction with replacing the cabinet furniture). For this reason, and to provide a consistent duration of the use stage, the reference service life (RSL) for residential countertops shall be ten (10) years.

4.4.2 Health aspects

Emissions to indoor-air or other releases should be given for those products whose components or cleaning and sealing agents contain volatile organic compounds that could potentially be released.

4.5 End-of-life stage

The end-of-life stage boundary begins when the used product is ready for disposal, recycling, reuse, etc. and ends when the product is landfilled, returned to nature (combustion, deterioration), or diverted to be recycled or reused; transportation to any of these end-of-life scenarios shall be included in the end-of-life stage. Processes required to convert the countertop into the starting material of a new product, and transportation from the recycle/reuse/conversion facility shall be excluded from the end-of-life stage. Processes that occur as a result of the disposal are also included within the end-of-life stage. End-of-life processes may include:

- collection of end-of-life products and packaging;
- dismantling of components from end-of-life products;
- shredding and sorting;
- incineration and sorting of bottom ash; and
- landfilling, landfill maintenance, and decomposition emissions.

In the absence of primary data on actual end-of-life treatment for the product, the most current version of the US EPA Municipal Solid Waste (MSW[4]) data or US EPA WARM3 model or surrogate (shall be identified in the EPD) within North America, or other appropriate regionally or nationally applicable model shall be used outside North America, to determine the percent of each material in the product(s) that can be recycled versus landfilled. The amount of each material in the product that can be assumed to be recycled is determined by multiplying the US EPA MSW4 within North America, or other appropriate regionally or nationally applicable model recycling rate, (in %) by the amount of each homogenous material type that is able to be disassembled. The remaining materials that are not recycled should be modeled for end-of-life using 80% landfill and 20% incineration[5].

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

4.6 Scope of PCR for upstream materials

The purpose and scope of this PCR is the process of constructing, installing, use, and end-of-life of countertops. It is assumed PCR's and LCA's (or LCI's) are available for the upstream materials such as sheets (e.g., HPL, natural stone, engineered stone, etc.), substrates (e.g., MDF,HDF, particleboard, plywood, etc.), basic materials (e.g., abrasives, resins, wood, concrete, glass, etc.), adhesives, or attachment hardware. For materials lacking this documentation, it is expected that it can be provided by industry trade groups, or in some cases by commercially available LCA software providers who maintain proprietary datasets. It is beyond the scope of this PCR to include all possible upstream materials.

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 14044-2006 for allocation procedures.

Where possible, allocation should be avoided by dividing unit processes into two or more sub-processes (as specified in ISO 14044, Section 4.3.4, *Allocation*), or through expansion of the system boundary to include the additional functions of co-products. If allocation cannot be avoided, the following hierarchy of allocation methods is preferred:

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

Deviation from these allocation rules shall be documented and justified.

For allocation due to recycling, companies shall use the Recycled Content Method. Allocation procedures for reuse and recycling discussed in ISO 14044-2006 (see Section 4.3.4.3) shall be applied for recycling situations.

Figure 2 illustrates a simplified process map for a product that uses the Recycled Content Method[6]. The Recycled Content Method is also referred to as the cut-off method, and the 100-0 method.

[6] The collection process is listed as an attributable end-of-life process; however, the location of this process depends on how the recycled material is collected, as discussed above and in Section 4, *System Boundary*,

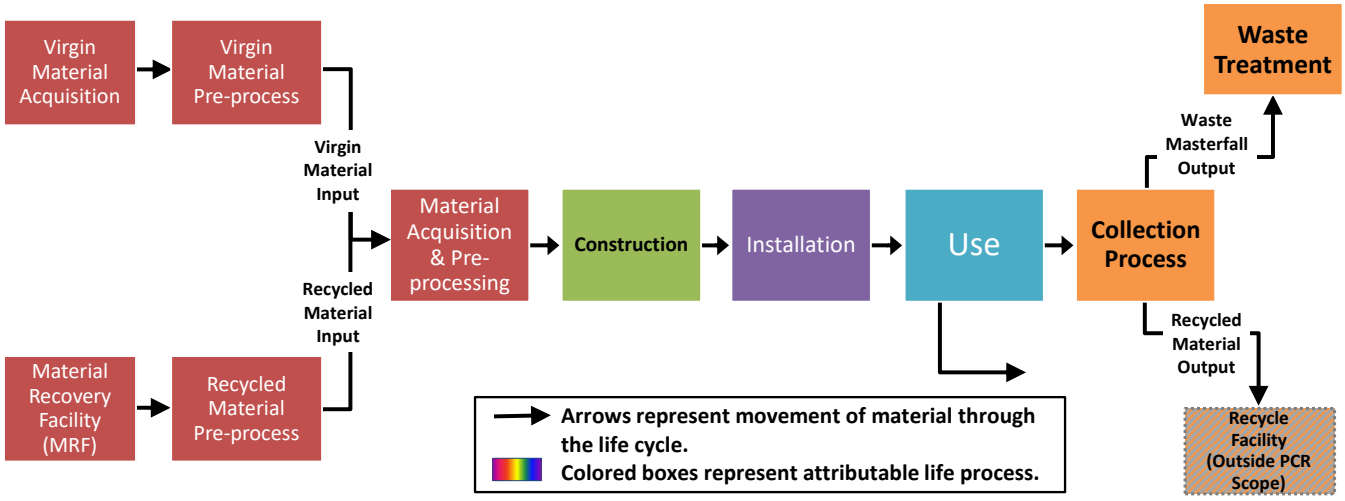

Figure 2 - Example process map illustrating the Recycled Material Input Method

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. Units in Section 2.2, *Product Characteristics* are represented as those typically used by each product type and are not always consistent with SI.

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 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 preference shall be the most local and relevant source starting with local power grid, to state power grid, to country sub-regional power grid, to the least preferred, national power grid) of manufacture, and shall document the unit processes; and describe how the secondary data are appropriately selected. The reporting company shall document and justify the inability to obtain primary energy data.

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).

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 construction process, current technology and current measurement capability. The data shall be consistent with the following requirements:

1. The information obtained from the construction process(es) shall be annual average 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 ten years. If data older than ten years is used from a secondary source, justification shall be included as to 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:
   a) time-related coverage: age of data and the minimum length of time over which data should be collected;
   b) geographical coverage: geographical area from which data for unit processes should be collected to satisfy the goal of the study;
   c) technology coverage: specific technology or technology mix; and
   d) uncertainty of the information (e.g., data, models and assumptions).

5. Data quality assessments examples include (but not limited to):
   a) USLCI
   b) ILCD

6. Table 9-2: Criteria to Evaluate the Data Quality Indicators, WRI product standard

7. 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:
   a) Representative of the geographical area, i.e., data from the same country, or from areas with the same energy supply mix;
   b) Technological equivalence;
   c) Boundaries towards nature; and
   d) 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 the input data shall be transparent.

7.4 Electricity modeling

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

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

installation of renewable energy at distributed locations. On-site renewable energy from solar cells or other renewable energy source can only be included in the inventory if they are not grid-linked. This process avoids the issue of double-counting renewable energy inputs.

7.5 Life Cycle Impact Assessment (LCIA) methodology

The following environmental impact categories shall be disclosed in the EPD per functional unit for products manufactured in North America. The impact categories shall also be divided per functional unit into quantity of each impact category for materials acquisition and pre-processing, construction (fabrication and assembly), installation, use, and end-of-life.

1. Global warming potential (GWP 100 years) [kg CO_2-eq.]
   IPCC (most recent version); Biomass CO_2 emissions shall be reported separately.

2. Acidification potential (AP) [mol H+ eq. / kg of emission]
   TRACI 2.0 (or most recent version); or outside North America, regionally applicable methodologies.

3. Photochemical ozone creation potential (POCP, or “Smog”) [kg O_3 eq. / kg of emission]
   TRACI 2.0 (or most recent version); or outside North America, regionally applicable methodologies.

4. Eutrophication potential (EP) [kg N eq. / kg of emission]
   TRACI 2.0 (or most recent version); or outside North America, regionally applicable methodologies.

5. Optional: Ozone Depletion Potential (ODP) [kg CFC-11 equivalent]
   TRACI 2.0 (or most recent version); or outside North America, regionally applicable methodologies

6. Optional: Abiotic Depletion Potential (ADP) [kg Antimony (Sb) equivalent]
   TRACI 2.0 (or most recent version); or outside North America, regionally applicable methodologies
   (Definition of ADP: A measure of the depletion of natural resources (including energy resources) such as iron ore, crude oil and wind energy, which are regarded as non-living.)

Note on impact categories: The EPD may optionally include equivalent CML 2001[7] (or current version) based impact categories for products with a customer base in Europe.

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 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 functional unit and in percentage of total weight.

8.2 Life cycle inventory data

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

1. Emissions to air {kg}
   a. SOx, NOx, CO_2, methane, N_2O, CO

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)

[7] CML = Centrum voor Milieuwetenschappen Leiden (Leiden University the Netherlands)
http://www.leidenuniv.nl/interfac/cml/ssp/databases/cmlia/index.html

3. Energy type and usages {MJ}
   a. Primary energy demand, fossil fuel based energy, nuclear
   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 Section 7.5, *LCIA Methodology* of this PCR.

1. Global warming potential
2. Acidification potential
3. Photochemical ozone creation potential
4. Eutrophication potential
5. Optional: Ozone depletion potential
6. Optional: Abiotic depletion potential

Note on impact categories: While the PCR specifies TRACI impact categories, the EPD may optionally include equivalent CML based impact categories for product with a customer base utilizing European standards.

9 OTHER ENVIRONMENTAL INFORMATION

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

Additional optional environmental impact categories based in ISO 14025, Section 7.2.3, that may be considered for the report include, but are not limited, to the following:

- Human Toxicity
- Ecotoxicity

Chemicals listed on the MSDS/SDS should be disclosed for all materials that make up 1% or more of the product by weight. MSDS/SDS reportable chemicals are defined in this PCR as a chemical listed on a Material Safety Data Sheet or Safety Data Sheet. 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 MSDS/SDS reportable chemicals. Companies choosing to report these chemicals should add information regarding potential exposure to these chemicals (i.e., some MSDS/SDS listed chemicals may have no route of exposure during normal use).

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

American Forest and Paper Association. *Life Cycle Inventory Analysis: Enhanced Methods and Applications for the Products of the Forest Industry.* The International Working Group, 2006.

Atherton, John. Declaration by the Metals Industry on Recycling Principles, International Journal of Life Cycle Assessment, 12 (1), 59-60, 2007.

FTC Part 260, Green Guides[8]

(ILCD, 2010) Joint Research Commission, 2010, ILCD Handbook: General Guide for Life Cycle Assessment[9]

Intergovernmental Panel on Climate Change (IPCC)[10]

ISO 14025:2006 *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*[11]

ISO 14040:2006 *Environmental management - Life cycle assessment – Principles and framework*[11]

ISO 14044:2006 *Environmental management - Life cycle assessment – Requirements and guidelines*[11]

EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)[12]

US EPA Waste Reduction Model (WARM)3

World Business Council for Sustainable Development's Global Water Tool

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

[8] Federal Trade Commission http://www.ftc.gov

[9] http://lct.jrc.ec.europa.eu

[10] World Meteorological Organization (secretariat to IPCC), 7bis Avenue de la Paix ,C.P. 2300, CH- 1211 Geneva 2, Switzerland http://www.ipcc.ch

[11] International Organization for Standardization (ISO), Case postale 56, CH-1211 Geneve 20, Switzerland. www.iso.org

[12] US EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI) http://www.epa.gov/nrmrl/std/sab/traci/

12 ENVIRONMENTAL PRODUCT DECLARATION

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 functional 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 datasets, and results of variability in assessment software tools used."
   2. Picture (optional) of product or family
   3. Manufacturer's name and contact information
   4. Information on the EPD program operator
   5. Date of certification and period of validity
   6. Functional unit
      i. Ten (10) year service life

B. Key environmental parameters:
   1. Global warming potential
   2. Primary energy demand
   3. Percentage of recycled content

C. Product specifications, as described in Section 2, *Product Description*.

D. Material resources, sorted by:
   1. Virgin renewable resources
   2. Recycled resources
   3. Virgin non-renewable resources

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

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

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

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

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

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 ± 5%, the EPD shall be adjusted. The EPD shall be reviewed and reissued every five (5) years from the date of issuance or earlier, as appropriate.

12.3 EPD 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.

***THE HOPE OF MANKIND** rests in the ability of man to define and seek out the environment which will permit him to live with fellow creatures of the earth, in health, in peace, and in mutual respect.*