

Product-Category Rules (PCR)  
for Preparing an Environmental Product  
Declaration (EPD) for  
Artificial Fiber Textiles

PCR 2011:1.0

Super Textile Corp.

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## 1. General Information

This document is to be used as the product category rules (PCR) for the global production and manufacturing of artificial fiber textiles. The requirements specified in this PCR are intended to be used for EPDs certified in accordance with ISO 14025 standard. This document shall be valid until December 31, 2013.

This PCR was prepared by Super Textile Corp. Representatives from major Taiwanese manufacturers of similar products and stakeholders were invited by the Taiwan Knitting Industry Association, Taiwan Bags Association, and Importers and Exporters Association of Taipei to the open consultation meeting on December 1, 2011, to participate in the discussion and review of this PCR. Environment and Development Foundation (EDF) then reviewed and approved this PCR.

This PCR is applicable to products with the Harmonized System (HS Code) of: 4202.22, 6101.30, 6102.30, 6105.20, 6106.20, 6110.30, 6301.90 and 6305.90.

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## 2. Company and product description

The EPD shall include information about the manufacturing company/organization. The information may include manufacturing process related information, and environmental related information, such as the environmental management system information. The information may also include special issues which the company/organization would like to emphasize, such as the products meeting certain environmental criteria, or environmental safety and health related information.

This PCR is applicable to both business-to-customer/consumer (B2C) and business-to-business (B2B) communications. While conducting inventory for environmental impact assessment, the artificial fiber textile products also include the accessories and packaging.

### 2.1 Product group function

Artificial fibers denote a type of fiber produced through chemical and/or mechanical processing of natural or synthetic polymer materials. They can be used in the manufacturing of various textile products including sweaters, knitted clothes, handbags, backpacks, computer bags, and school bags, etc. Different artificial fiber textiles' applications include:

- Polyester fiber: e.g., suits, dresses, trousers or casual wear, jackets, bags, etc.;
- Polyacrylonitrile fiber (PAN): Commonly used to replace wool in woven sweaters, suits, dresses, and sportswear, etc.;
- Rayon: Used as an alternative to silk in applications such as lining for clothing;
- Polyester fiber and Rayon blend: e.g., work clothes, school uniforms, etc.

### 2.2 Product constituents

The artificial fiber textiles are textile products with the main constituents as artificial fibers. The constituents of artificial fiber textiles are listed as follows:

## **Main constituents:**

1. Artificial fibers: May be single or blend/mixture of the following artificial fibers:
  - 1.1. Regenerated Fiber
    - 1.1.1 **Inorganic Regenerated Fiber:** Glass Fiber, Metal Fiber, Rock Fiber, Slag Fiber, etc.
    - 1.1.2 **Organic Regenerated Fiber:** Protein Fiber: Casein Fiber, Groundnut Fiber, Soybean, Maize Fiber, PLA Fiber, etc.
    - 1.1.3 **Cellulose Fiber:** Viscose Rayon, Cuprammonium Rayon, Lyocell, etc.
    - 1.1.4 **Others:** Chitin Fiber, etc.
  - 1.2. Semi Synthetic Fiber
    - 1.2.1 Acetate Fiber
    - 1.2.2 Triacetate Fiber
  - 1.3. Synthetic Fiber
    - 1.3.1 **Condensation Polymer:** Polyamide Fiber: Nylon 6, Nylon 6.6, Nylon 11; Polyester Fiber: PET, PBT, PTT.
    - 1.3.2 **Addition Polymer:**
      - 1.3.2.1. Polyacrylonitrile Fiber (PAN) or called Acrylic Fiber
      - 1.3.2.2. Polyethylene (PE) Fiber
      - 1.3.2.3. Polypropylene (PP) Fiber
      - 1.3.2.4. Polyvinylalcohol (PVA) Fiber
      - 1.3.2.5. Polyvinylchloride (PVC) Fiber
      - 1.3.2.6. Polytetrafluoroethylene (PTFE) Fiber
      - 1.3.2.7. Polyurethane (PU) Fiber
2. Natural Fiber
  - 2.1 Vegetable Fiber: Cotton, Linen, Piña, Coir, etc.
  - 2.2 Animal Fiber: Wool, Horse hair, Rabbit hair, Silk, etc.
  - 2.3 Mineral Fiber: Very few unprocessed natural minerals can serve as raw materials for textile fiber. For example, Asbestos
3. Dyes
  - 3.1. Natural dyes
  - 3.2. Synthetic dyes
4. Auxiliary materials: Additives, scouring agent, spray tests, flame retardants (PBB, TRIS, TEPA), etc.
5. Accessories : zippers, button, carrying straps, etc.

## **Other constituents**

1. Printing
  - 1.1. Roller printing
  - 1.2. Screen printing
  - 1.3. Heat transfer printing
2. Others; e.g., sequins etc.

The data quality requirements for the main constituents are described in Section 9 on calculation rules and data quality requirements. The EPD shall also include the other constituents of the product, but their data quality requirements are different from those of the main constituents.

## 2.3 Product technical description

The product technical description part of the EPD may include but not limited to the following information:

1. Type
2. Size
3. Color
4. Material type
5. Washing method
6. Others: :
  - 6.1. Safety requirements: including free formaldehyde content test, hexavalent chromium content analysis test
  - 6.2 Tear strength
  - 6.3 Spray test

## 3. List of materials and chemical substances

The contents of the following materials and substances in the product shall be declared:

- All materials of the product (excluding packaging material) with weight ratio (material weight/product weight (excluding packaging))  $\geq 1\%$ ;
- All materials of the packaging with weight ratio (material weight/packaging weight)  $\geq 1\%$ ;
- All materials/substances in the product (including packaging) regulated by legal, customer and environmental requirements, for example:
  - Free formaldehyde content test (in accordance with bags and boxes product evaluation standard CNS 15331, S 2158 Section 4.3);
  - For adult or indirect contact with leather, textiles and glued materials, the free formaldehyde content shall not exceed 300 mg/kg;
  - For users under 14 years of age, or direct contact with leather, textile and glued materials, the free formaldehyde content shall not exceed 75 mg/kg;
  - Hexavalent chromium content analysis test (in accordance with bags and boxes product evaluation standard CNS 15331, S 2158 Section 4.5, Appendix A-leather, Appendix B-metal products and rubber, plastic metal coating):
    - ◆ hexavalent chromium content of leather materials not more than 10mg/kg;
    - ◆ test result for hexavalent chromium content of metal products and rubber, plastic metal coatings should be negative.

## 4. Declared unit

The declared unit is one piece of artificial fiber textile with the material and product weight declared. This unit is chosen because the artificial fiber textile products are marketed and sold in such a unit.

## 5. System boundaries

The main system boundaries for the declared product system are presented as follows:

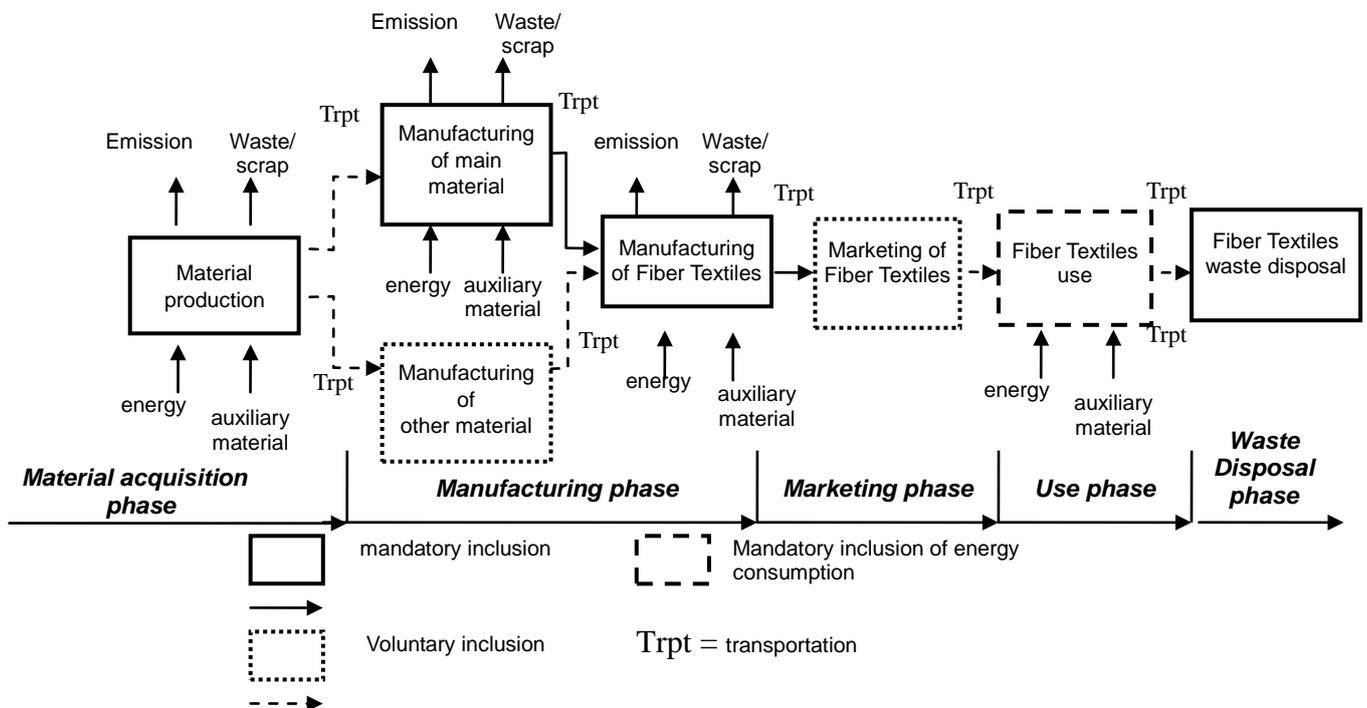


Figure 1 System boundary of the artificial fiber textile product system

As noted in Figure 1 above, the life cycle of the artificial fiber textile product covers five life cycle stages: raw material acquisition, product manufacturing, distribution, product use and waste disposal. The data quality requirements for the main constituents and other constituents are described in Section 9 on calculation rules and data quality requirements.

### Raw Materials Acquisition Stage

The LCA shall include information for the following unit processes:

- Material extraction and manufacturing of raw materials for main constituents and other constituents, as well as forming and refining of raw materials;
- Manufacturing of main raw material and treatment of process waste.

Reporting of transportation for raw materials is optional (voluntary).

### Manufacturing Stage

The LCA shall include information for the following unit processes:

- Manufacturing of main constituents and textile products and generation of associated process waste;
- Transportation of main constituents and semi-finished products to product manufacturing plant.

Reporting for manufacturing of other constituents is optional (voluntary).

### Distribution and Marketing Stage

The LCA shall include information for the following unit processes:

- Transportation of products to the distribution sites;
- Inventory and reporting of transportation from sales/distribution sites to customers is optional (voluntary).

### Use Stage

This PCR stipulates that the water and energy consumption for textile product cleaning during the use stage should be considered. With the exception of special cleaning instructions which required assumption of special usage scenario, a typical scenario for cleaning of artificial fiber textile can be assumed as follows:

#### Furniture decoration products

The product can be reused after each cleaning/washing for a total of two years. Washing is done by washing machine with cold water and tumble dry or hang dry (without heat). The usage scenario is assumed as follows:

- (1) Power rating of washing machine: There are two types of washing machines: top-load and front load. It is assumed the washing machine is a top-load machine with a power rating of 420 W.
- (2) Washing time and water consumption: Assume washing 5 kg of furniture textile each time. Each washing cycle takes 40 minutes (0.67 hour) and requires 16 L of cold water for washing and 32 L of cold water for rinsing. That is, 48 L of cold (non-heated) water is used for each cleaning cycle.
- (3) Total number of washing: Washing 10 times (during the two-year period)

Based on the above scenario, the total power and water consumption for each kg of product during the use stage (2 years) can be calculated as:

Electricity consumption during use stage (kWh) = (W/5) \* 0.42 (kW) \* 0.67 (h/time) \* 10 (times).

Water consumption during use stage (m<sup>3</sup>) = (W/5) \* 0.048 (m<sup>3</sup>/time) \* 10 (times).

#### Clothing

The product can be reused after each cleaning/washing for a total of two years. Washing is done by washing machine with cold water and tumble dry or hang dry (without heat). The usage scenario is assumed as follows:

- (1) Power rating of washing machine: There are two types of washing machines: top-load and front load. It is assumed the washing machine is a top-load machine with a power rating of 420 W.
- (2) Washing machine and water consumption: Assume washing 5 kg of clothing each time. Each washing cycle takes 40 minutes (0.67 hour) and requires 16 L of cold water for washing and 64 L of cold water for rinsing. That is, 80 L of cold (non-heated) water is used for each cleaning cycle.
- (3) Total number of washing: Assume one cleaning per week for two years for a total of 104 cleaning cycles.

Based on the above scenario, the total power and water consumption for each kg of product during the (2 years) use stage can be calculated as:

Electricity consumption during use stage (kWh) = (W/5) \* 0.42 (kW) \* 0.67 (h/time) \* 104 (times).

Water consumption during use stage (m<sup>3</sup>) = (W/5) \* 0.08 (m<sup>3</sup>/time) \* 104 (times).

Other: For products with specific cleaning instructions, calculation should be done based on specific cleaning scenarios.

### **Recycling/end-of-life Stage**

The LCA shall include information for the following unit processes:

- Transportation of end-of-life product to waste/resource treatment or recycling facility;
- Environmental impacts resulting from product's waste treatment (landfill or incineration);
- Reporting of recycling information (such as recycling and dis-assembly report or information on recycling channels) is mandatory in the EPD. Also, the environmental impact shall be calculated based on the declared recycling rate.

## **5.1 Specification of different boundary settings**

### **Boundary in time**

The validity period for the LCA results presented in the LCA report shall be defined.

### **Boundary towards nature**

If the manufacturing processes are located within Taiwan, the solid waste categories as defined in Taiwan's Waste Disposal Act shall be adopted. If the processes are located in other countries, equivalent legal requirements shall be considered.

The natural boundary of the system shall describe the boundary where the materials and energy resources flow from nature into the system, and where the water and air emissions and waste are released out of the system.

Only the waste which is required to be disposed of needs to be considered; landfilling process does not need to be included. If the waste is generated through wastewater treatment or incineration process, such waste should be included into the wastewater treatment or incineration process.

### **Boundaries in the life cycle**

The boundaries in the product life cycle are described in Figure 1. The construction of the site and infrastructure, as well as the production of manufacturing equipment and activities of the workers, does not need to be included.

### **Boundaries towards other technical systems**

Boundaries towards other technical systems describe the inputs of material and other components towards other systems, as well as outputs of materials towards other systems. For the inputs of recycled materials and energy towards the product manufacturing stage, the transportation between the recycling process and use of recycled materials shall be included in the data set. For the production of recyclable products during the manufacturing stage, the transportation towards the recycling process shall be included.

*(Note: Further explanations are provided in Section 7 on open-loop recycling)*

### **Boundaries regarding geographical coverage**

The manufacturing stage may cover manufacturing processes located on any sites around the world. For processes located in a specific region, the data used should be representative of the region. The data for the main constituents shall be the specific regional data for the region where the process takes place (see Section 9). For ease of comparison, no matter where the emissions are generated, the same environmental impact parameters should be used for life cycle impact assessment (see Section 10).

## 6. Cut-off rules

For any impact category, if the sum of various impacts from a specific process/activity is less than 1% of the impact equivalent in that category, such a process/activity may be neglected during the inventory analysis. Nonetheless, the accumulated impact of neglected process/activity may not exceed 5%. Components and materials omitted from the LCA shall be documented.

(Note: This judgment for this “1% Rule” is based on the environment relevance assessment of material input to the system, and does not consider special and exceptional environmental impacts.)

## 7. Allocation rules

The main allocation rules shall be valid for the entire product system. For other secondary processes, other allocation rules may be defined; however, the use of these rules should be justified. Product-specific information should be preferentially collected in order to avoid the need for allocation. While selecting allocation rules, the following principles are recommended.

- **Multi-output:** The allocations are based on the changes in the resource consumption and pollutant emissions (for example, adopted quantity allocation for some main component, or surface allocation for some components), following the changes in the studied system’s output product or function or economical relationship.
- **Multi-input:** The allocation is based on actual relationship. For example, the manufacturing process’s emissions may be affected by the change in waste flow input.
- **Open loop recycling:** For the input of recycled materials or energy during the manufacturing stage of the product system, the transportation between the recycling process and the recycling to material use shall be included in the dataset. For the product which shall be recycled during the manufacturing stage, the transportation towards the recycling process shall be included.

Notes:

- *Allocation may be avoided through avoidance of dividing processes, for example as described in Section 6.3 of ISO/TR 14049; or through expansion of system boundary (for example as described in Section 6.4), so that the amended system shares the same product exchanges as the original system.*

## 8. Units

The base units and derived units of the International System of Units (SI, *Système International d'unités*) shall be used preferentially.

Power & energy units:

- power unit: W
- energy unit: J

Specification units:

- length unit: m

- capacity unit: m<sup>3</sup>
- area unit: m<sup>2</sup>
- weight unit: kg

If necessary, prefixes may be used before the SI units.

- 10<sup>9</sup> = giga, symbol “G”
- 10<sup>6</sup> = mega, symbol “M”
- 10<sup>3</sup> = kilo, symbol “k”
- 10<sup>-2</sup> = centi, symbol “c”
- 10<sup>-3</sup> = milli, symbol “m”
- 10<sup>-6</sup> = micro, symbol “μ”
- 10<sup>-9</sup> = nano, symbol “n”

## 9. Calculation rules and data quality requirements

### **Date quality requirements for the raw material acquisition stage**

- Generic data may be used for the acquisition, production, forming and refining of raw materials used for the constituents of the artificial fiber textile products. Please refer to Appendix I for the common sources of generic data.

### **Date quality requirements for the manufacturing stage**

- Site specific data (for example, specific data for manufacturing plant or transportation) shall be used for the manufacturing of major constituents of the artificial fiber textile products. If other types of information are used, description of the information and rationale for using the information shall be provided. For site specific data of main materials manufacturing plants, specific data from a plant representative of such a site may be used.
- Generic data may be used for the manufacturing of other materials for the artificial fiber textile products, and based the calculation on actual consumption. Please refer to Appendix I for the common sources of generic data.
- When generic data are used, the equivalence between the chemical and/or physical process of referred systems shall be considered. Moreover, it is also recommended to consider the date or geographic aspects of the data quality when feasible.
- Generic data may also be used when suppliers refuse to provide specific data, or when even if generic data are used in place of specific data, there is only minor impact to the results. The general rule is that if generic data are used in place of specific data, their combined contribution for all life cycle stages shall not be greater than 20% of total impacts for each impact category. But there may be certain exception to specific products, and such exceptions shall be explained.
- The data shall be representative for the average of a specific year. If the average data for a specific time period of less than one year is used, the reason for using such data shall be provided.
- The electricity mix for the manufacturing stage should be site specific data. If site specific data cannot be obtained, the official electricity mix for the country where the site is located may be used as approximate value. The electricity mix should be documented.
- For the definition of hazardous waste, the definition as defined in Taiwan’s Waste Disposal Act shall be used for sites located in Taiwan. For sites located outside Taiwan, legal requirements for the host country shall be observed.
- For the transportation of main constituents to the manufacturing plant, the actual transportation

modes used and distance traveled shall be considered.

#### **Date quality requirements for the distribution and marketing stage**

- For the transportation of product to the distribution sites or retailer sites, the actual mode of transportation and distance traveled shall be considered.

#### **Date quality requirements for the use stage**

- The resource input and energy consumption of product cleaning/laundry during the use stage shall be considered.
- For the energy/resource input during the use stage, published data or generic data for the country/region where the product is being use may be used. Please refer to Appendix I for the common sources of generic data used internationally. But the date of the data may not be older than 1990.

#### **Date quality requirements for the recycling/waste disposal stage**

- For transportation of end-of-life product as post-consumer waste for delivery to processors or recyclers, the data from national, industry or consumer surveys can be used. When such data cannot be obtained, evaluation based on assumed scenario can be made, and the assumptions for such a scenario shall be reported in the EPD.
- Generic data may be used during the recycling/end-of-life stage, if for specific reason the site specific data for the recycling/waste disposal system cannot be obtained. Then generic data and recycling rate may be used to calculate environmental impact. Please refer to Appendix I for the common sources of generic data used internationally. But the date of the data may not be older than 1990.

### **10. Parameters to be declared in the EPD**

The following parameters shall be declared in the EPD:

#### **Energy use**

- The energy consumption during each product life cycle stage shall be declared. If the product is intended for end-users, the power consumption during the use stage shall also be declared.
- The following units shall be used preferentially:  
kW or W for power; J or MJ for energy.

#### **Resource use**

The information on resource input during the product life cycle stages shall be declared.

#### **Impact equivalents expressed as potential environmental impacts**

- |                                  |   |
|----------------------------------|---|
| -Global warming                  | kg CO <sub>2</sub> equivalent               |
| -Acidification                   | kg SO <sub>2</sub> equivalent               |
| -Photochemical oxidant formation | kg C <sub>2</sub> H <sub>4</sub> equivalent |

-Eutrophication	kg PO <sub>4</sub> <sup>3-</sup> equivalent
-Ozone depletion	kg CFC-11 equivalent

Note: For characterization factors of each impact category, please refer to *EPD Supporting Annexes*, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from [www.environdec.com](http://www.environdec.com).

### **Additional information**

- Recyclable materials (optional)
- Information on secondary materials (optional)
- Waste (classification):
  - Hazardous waste as defined in Taiwan's Waste Disposal Act. Follow host countries' laws for sites outside Taiwan.
  - Other waste.
  - Where technologically possible, plastic parts of the treadmill weighing  $\geq 25$  g shall be marked in accordance with the ISO 11469 and ISO 1043 Part 1/2/3/4, SPI or other international standard label to facilitate their identification and recovery at the end of life.
  - Plastic packaging materials marking: The Plastic packaging materials shall be labeled on the parts with SPI or other international standards for ease of sorting.

## **11. Recycling information**

If practical, information for the constituents which can not be recycled and therefore should be disposed of properly during the end-of-life stage may also be included.

## **12. Other environmental information (Optional)**

The EPD may cover information including technology adopted, site of product manufacturing and assembly, as well as information on other working environment, health and risk-related aspects.

If this PCR is to be used for product carbon footprint declaration purpose, in the declaration, information regarding commitment on GHG reduction should be included and shall ensure that the commitment is measurable, reportable and verifiable. The organization may also list environmental and energy management related information, such as awards, commendations and system certifications (e.g., ISO 14001, ISO 14064-1, IECQ HSPM) etc.



## 14. References

Energy Star Computer Specification -Version 5.2

The EPD shall make reference to the following documents:

- EPD General Program Instructions, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from <http://www.environdec.com/>;
- Relevant PCR documents;
- The underlying LCA report.

When available, the following documents shall also be referenced:

- Other documents and recycling instructions which verify and complement the EPD.

## Appendix I – Generic Data Sources to Refer to

For processes located within Taiwan, Taiwan generic data or the data published by the commercial, industrial and energy competent authorities of the Republic of China (ROC) government, may be used. However, for other regions (such as EU), if there are more relevant generic data available, these data should be used instead. When data from the following generic databases are used, the most current and updated data should be used.

Material	Database
Packing materials, transport, Waste treatments	BUWAL 250
Steel, Primary copper, Copper products, Electricity, Fuels, Aluminum, Chemicals, Transports, Waste management	ELCD
	EIME (Environmental Information and Management Explorer) EcoBilan
Plastics	PE Plastics Europe (Association of Plastics Manufacturers in Europe)
	ELCD
	EIME (Environmental Information and Management Explorer) EcoBilan
Electronic components	ELCD
	EIME (Environmental Information and Management Explorer) EcoBilan
General Database	Ecoinvent
	The Boustead Model
	PE-GaBi
	DoITPro(Taiwan)

## **Appendix II – Reporting Format for the EPD**

This appendix provides guidance information for the titles of sections, types of data and required information to be reported in the mandatory reporting part of the EPD. As a generic reporting template, the following titles and sub-titles are recommended:

*(Refer to the PCR manual for the section numbering, the information in Italics are the recommended data/information for inclusion)*

### **Introductory part**

Each EPD should have an introduction part on the top part of the EPD which includes the following information:

- *Company/organization name*
- *Product name*
- *EPD registration number*

### **Description of the company/organization and product/service**

#### ***Company/Organization***

- *Description of company/organization*
- *Description of overall working environment, existing quality system and environmental management system*

#### ***Product and services (see Section 2)***

- *Product's main applications*
- *Description of product specification, manufacturing process, manufacturing sites (if there are several sites)*
- *For product's environmental performance aspects, characteristics which may improve the usefulness of product*
- *Other types of relevant information, for example, special manufacturing processes with special advantages to the environment*

### **List of materials and chemical substances**

- *Content declaration (see Section 3)*

### **Presentation of the environmental performance**

- *Outline of the LCA methodology, for example, period of LCA, declared units, system boundaries (graphical presentation), cut-off and allocation rules, and data sources.*

#### ***Manufacturing stage (see Section 10)***

#### ***Use stage (see Section 10)***

- *Geographical region for product delivery*
- *Transportation data*
- *End-of-life information*

### **Information about Company and Certification Organization**

#### ***Recycling information (see Section 11)***

#### ***Other environmental information (see Section 12)***

#### ***Information regarding certification***

- *Names of certification and verification organizations*

- *Validity of certification certificates*
- *Compliance with legal and relevant requirements*

**References** (see Section 14)

- *relevant PCR documents*
- *EPD General Program Instructions, Version 1.0 (2008-02-29)*
- *underlying LCA study*
- *other supporting documents for LCA information*
- *other relevant documents regarding company/organization's environmental activities*

### Appendix III Abbreviations

<b>Acronym</b>	<b>Common Name</b>
APLAC	Asia Laboratory Accreditation Cooperation
CFP	Carbon Footprint of Product
EPD	Environmental Product Declaration
ErP	Energy Related Product
ILAC	International Laboratory Accreditation Cooperation
ILAC MAR	International Laboratory Accreditation Cooperation Mutual Recognition Arrangement
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rule
RoHS	The Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
SPI	Society of the Plastics Industry
TAF	Taiwan Accreditation Foundation
TEC	Typical Energy Consumption
Trpt	Transportation
WEEE	the Waste Electrical and Electronic Equipment Directive