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primus vitoria ceramics

Environmental Product Declaration (EPD)

Ceramic tile – Aradas

Unit

In accordance with NP EN 15804+A1:2015

Cofinanciado por:

COMPETE 2020 PROGRAMA OPERACIONAL COMPETITIVIDADE E INTERNACIONALIZAÇÃO

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Informação

This environmental declaration has been produced by the Technological Center of Ceramics and Glass (from Portuguese "Centro Tecnológico da Cerâmica e do Vidro" – CTCV) at the request of PRIMUS VITÓRIA – AZULEJOS, S.A.. The information contained therein is provided under the responsibility of CTCV and PRIMUS VITÓRIA, in accordance with NP EN 15804 + A1:2015.

Any use, in whole or in part, of the information provided in this document must at least be accompanied by a complete reference to the original Environmental Product Declaration (EPD) as well as its producer, who may provide a complete copy.

CEN NP EN 15804 + A1:2015 serves as the Product Category Definition Rule (CPR).

In addition, the CPR for floor coverings (version 1.0) of the DAPHabitat System was also consulted.

Reading guide

Display Rules

The following display rules are used:

- Values are expressed according to the following scientific notation: $0,0123=1,23x10^{-2}$ =1,23E-02;
- For a null result, the value zero is represented;
- All values are expressed with two significant digits.

Abbreviations Used

- LCA : Life Cycle Analysis
- CTCV : Technological Center of Ceramics and Glass
- EPD : Environmental Product Declaration
- VUR : Reference lifetime
- LCV/LHV : Lower calorific value
- FU : Functional unit

Precautions for using EPD for product comparison

EPDs from construction products may not be comparable if they do not comply with the standard NP EN 15804 + A1:2015.

NP EN 15804 + A1:2015 defines in point 5.3 – Comparability of EPD for construction products, the conditions under which construction products may be compared based on information provided by the EPD:

"Comparison of the environmental performance of construction products using EPD information shall be based on the product's use in and its impacts on the building, and shall consider the complete life cycle (all information modules)."

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1 General information

1.1 Name and address of issuer and manufacturer

The environmental declaration was prepared by the Technological Center of Ceramics and Glass (CTCV) at the request of PRIMUS VITÓRIA. The information presented here is the the responsibility of CTCV and PRIMUS VITÓRIA, based on NP EN 15804+A1:2015 (CPR for construction products)

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1.2 Company

PRIMUS VITÓRIA - AZULEJOS, S.A. is a medium-sized company, established in 1969, headquartered in Aveiro. It is dedicated to the design and production of traditional tiles, ceramic floor and wall tiles.

PRIMUS VITÓRIA, has two manufacturing units spaced about 12 km away. The headquarters is in Aradas, being a factory that started production in 1969. In 2009 a new production unit was opened, located in the industrial area of Taboeira, designed in terms of layout, which allows a production with high levels of efficiency in small formats, namely 15x15 and 20x20. The company has been certified since 2004 according to the ISO 9001 standard (quality

management system) and with products certified by EN 14411. Its activity is focused on regulatory and legal compliance, namely with regard to the Environmental, Health and Safety area at work.

PRIMUS VITÓRIA has an installed capacity for the production of 4 million m^2 per year, with a substantial part of its production destined for export (Holland, England, France, Belgium, Sweden, Finland, Norway, Germany, Spain, United Arab Emirates, United States of America, etc.).

In terms of Research, Development and Innovation (IDI), it is taking the first steps towards capitalizing on its know-how in the search for new techniques, raw materials, design and technology, which allows the development of new products, aimed at to follow the trends of the various markets where it operates, using tax benefits such as SIFIDE.

1.3 EPD type

This EPD is an individual statement and describes the life cycle of ceramic tile products manufactured by PRIMUS VITÓRIA from cradle-to-gate, with the aim of promoting sustainable construction.

The data presented in this statement are the result of a life cycle assessment study, carried out at the company P PRIMUS VITÓRIA, in order to determine the environmental impacts associated with the **ceramic coating (in monoporous)** produced in its industrial units, in the form of an Environmental Product Declaration (self-declaration).

The database for obtaining this declaration is from the year 2018.

1.4 Date of publication

February 2020

1.5 Verification

This EPD is voluntary and is not subject to verification by third parties and is intended to provide stakeholders with environmental information regarding products developed by PRIMUS VITÓRIA - Aradas factory.

2 Product Description

2.1 Declared Unit

Taking into account the previous considerations and that this EPD convers only the product stage (A1 to A3) (*cradle-to-gate*), the unit used is 1 m^2 of ceramic tile (including packaging) for interior wall cladding, to calculate performance environmental impact of the product.

2.2 Product

The ceramic tiles produced by the company PRIMUS VITÓRIA are used as a covering for interior walls. This product has a wide range of aesthetic and dimensional options, both in terms of visual effects, texture and colors.

PRIMUS VITÓRIA manufactures these products in various dimensions, namely with the characteristics shown in Table 1.

Table 2 – Products manufactured by PRIMUS VITÓRIA

Thickness (mm)	*Density per m^2 (kg/m^2)*
5,2	8,97
6,3	9,79
6,8	11,65
7,3	12,51
7,7	13,06
8,0	13,57
8,2	13,70
9,0	15,46
6,8 bis.	10,05

2.3 Use stage – scope/ Application

Ceramic tiles are used for the following applications:

- Wall covering;
- Interior lining in residential, public and industrial buildings.

2.4 Other technical features not included in the functional unit

Technical Characteristics	*Test method*	*Requirements*	*PRIMUS VITÓRIA Value*
Size [C] (%)	**EN ISO 10545-2**	± 0,5 [C]	± 0,5 [C]
Thickness (%)		± 10	± 10
Straightness of sides (%)		± 0,3	± 0,3
Rectangularity (%)		± 0,5	± 0,5
Flatness - Centre curvature (%)		± 0,5 / -0,3	± 0,5 / -0,3
Flatness - Edge curvature (%)		± 0,5 / -0,3	± 0,5 / -0,3
Flatness - warpage (%)		± 0,5	± 0,5
Surface Quality (% free from visible defects)		> 95	In accordance
Water Absorption (%)	**EN ISO 10545-3**	10 - 20	14 - 20
Modulus of rupture (N / mm²)	**EN ISO 10545-4**	≥ 15 [A] ≥ 12 [B]	≥ 15 [A] ≥ 15 [B]
Breaking strength (N)		≥ 200 [A] ≥ 600 [B]	≥ 200 [A] ≥ 600 [B]
Coefficient of linear thermal expansion (from ambient temperature to 100 °C)	**EN ISO 10545-8**	-	Available value (per white body type)
Thermal Shock Resistance	**EN ISO 10545-9**	Required	Resistant (per white body type)
Moisture expansion (mm/m)	**EN ISO 10545-10**	-	Available value (per white body type)
Crazing resistance	**EN ISO 10545-11**	Required	Resistant
Resistance to low concentrations of acids and alkalis	**EN ISO 10545-13**	-	Min. Class GLB
Resistance to household chemicals and swimming pools		Min. Class GB	Min. Class GB
Resistance to staining	**EN ISO 10545-14**	Min. Class 3	Min. Class 3
Release of cadmium and lead	**EN ISO 10545-15**	Required	In accordance
Reaction to fire	**Decision 96/603/EC**	A1	A1

[A] For thicknesses < 7,5mm

[B] For thicknesses ≥ 7,5mm

[C] For a dimension of 75mm, consider a tolerance of +/- 0,75mm

2.5 Main Product Components and/or Materials

Raw material	***Percentage***
Water	-
Atomized powder	92,4 %
Dyes	< 0,005 %
Glasses	5 %
Engobes	2,6 %
Additives	< 0,1 %
Packing	***Percentage***
Wooden pallets	55 %
Card boxes	39,6 %
Plastic packaging (film + strap)	5,4 %

2.6 Substances on REACH Candidate List (if greater than 0.1% by mass)

The product does not contain any candidate substance from the Reach candidate list of substances of very high concern with more than 0.1% by mass.

2.7 Reference lifetime

Parameters	***Units / Values***
Reference life	50 years
Declared product properties (of factory) and finishing, etc.	Product characteristics are in accordance with EN 14411. Some references certified by QB UPEC
Theoretical application parameters (if imposed by the manufacturer), including references to appropriate practice	Different product models can be installed according to the manufacturers or DTU 52.2 recommendations
Assumed quality of work when installation complies with manufacturer's instructions	Works must meet the manufacturers or DTU's recommendations mentioned above, if necessary
Outdoor environment (for outdoor applications) such as bad weather, pollutants, UV rays and wind exposure, building orientation, shading, temperature	Not applicable (no implications)
Indoor environment (for indoor applications) e.g. temperature, humidity, chemical exposure	Applicable
Condition of use, e.g. frequency of use, mechanical exposure	The product can be used only indoors
Maintenance e.g. frequency required, type and quality and replacement of replaceable components	Periodic cleaning using non-abrasive products

3 Life Cycle Stages

In general, the flowchart for the manufacture of the ceramic material under study:

- Reception of the raw material (atomized powder) or preparation of this in the case of glasses
- Forming (pressing)
- Drying
- Glazing and Decoration
- Firing
- Choice and packaging
- Quality control
- Storage

This EPD assesses and evaluates the product life cycle from cradle-to-gate, comprising modules A1, A2 and A3 defined in NP EN 15804 + A1:2015.

Figure 1 shows the production process of PRIMUS VITÓRIA.

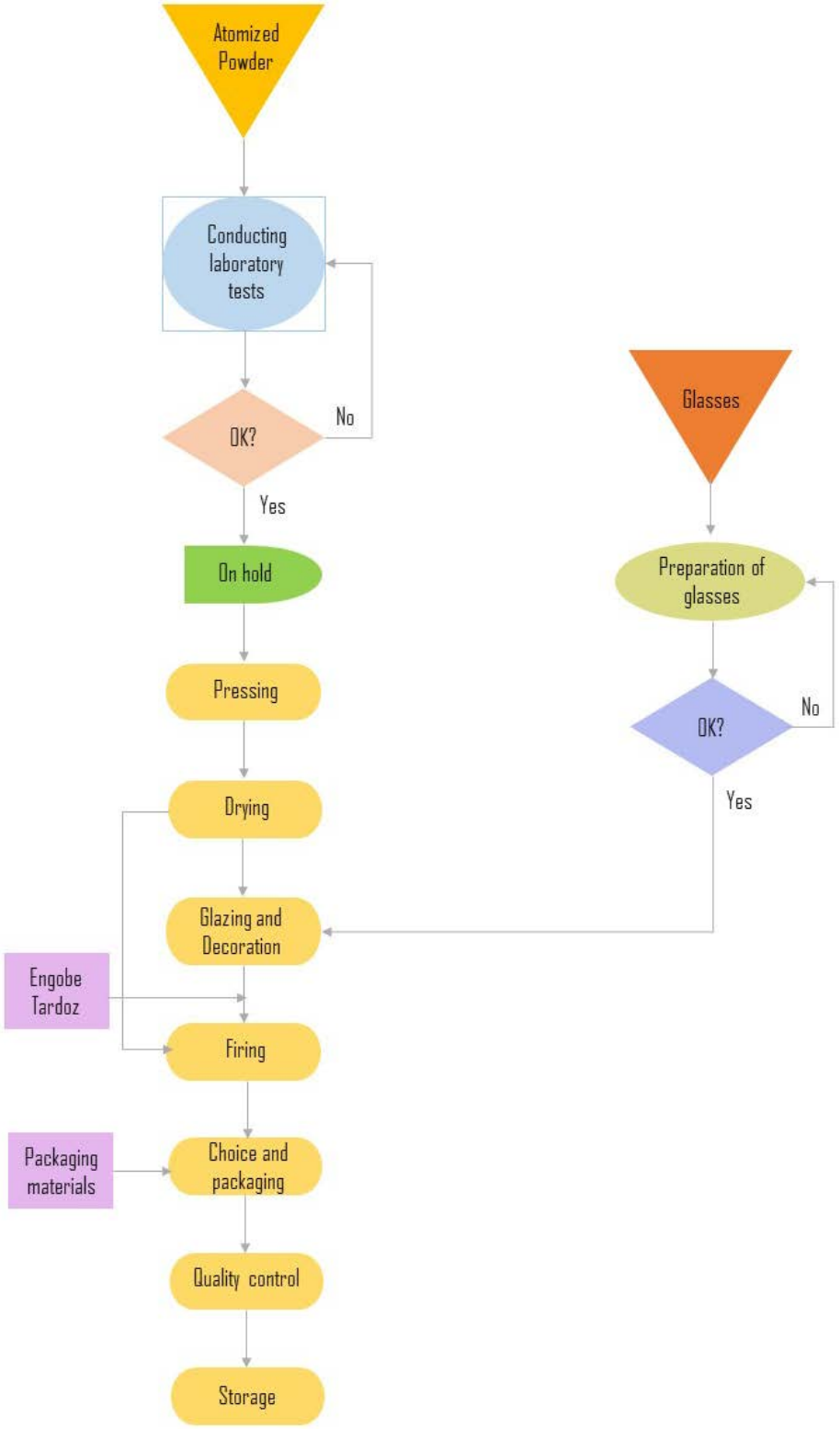


Figure 1 - PRIMUS VITÓRIA production process

3.1 Product stage; A1 – A3

The Aradas unit produces ceramic coating by the powder pressing process. The atomized powder used as the main raw material is obtained externally from a Portuguese company. The remaining raw materials used (glasses, dyes, etc.) are also purchased externally.

In the preparation of the glasses, this phase involves the dosage of raw materials, mixing and humidification / dilution / coloring.

At the beginning of the production process, the piece is formed by pressing the powder (using molds, depending on the type of product desired), followed by drying (natural gas dryers) to remove excess moisture present in the powder. After the drying step, the product can go directly to firing or to a glazing and decoration step.

In the glazing line, glazes and other types of decoration are applied with the help of equipment specifically designed for this purpose (e.g. digital printer).

At a later stage, the cooking phase takes place, which is carried out in a roller oven with pre-established cycles. This is followed by the choice stage that is made on one line automatically with the accompaniment of an operator, and on other lines manually (semi-automatic).

Finally, packaging is carried out (using recycled paper, plastic, straps and wooden pallets), where there is quality control of each batch produced, followed by its storage.

3.2 Construction stage; A4 – A5

The construction phase of the building materials begins with their transportarion to the jobsite (A4).

This EPD evaluates only the product production stage, integrating steps A1 through A3. Therefore, the following scenarios of the construction step (modules A4 and A5), use stage (B1 to B7) and end of life stage (C1 to C4) are not considered in the present work.

3.3 Use stage; B1 – B7

The impacts and benefits of this step are excluded from the system boundary, and therefore not assessed.

3.4 End of life stage; C1 – C4

The end-of-life stage consists of the following modules: Deconstruction/Demolition (C1), Transport of waste to its processing and end-of-life location (C2), Processing of waste for reuse, recovery and/or recycling (C3) and elimination (C4).

The end-of-life phase is the last phase of a material's life cycle but can become the first if after demolition, recycling and reuse of waste is carried out, that is, the valorization of the material considered to be at the end of its life.

The impacts and benefits of this step are excluded from the system boundary and are therefore not evaluated.

3.5 Recycling/ reuse / recovery potential; Module D

The impacts and benefits of this step are excluded from the system boundary, so they are not evaluated.

4 Information for calculating the Life Cycle Assessment

4.1 PCR used

This declaration is based on the standard NP EN 15804 + A1:2015: basic rules for the category of construction products.

4.2 System boundaries

This EPD assesses the product life cycle from cradle-to-gate, comprising modules A1, A2 and A3 defined in NP EN 15804 + A1:2015.

System boundaries distinguish the separation between the environment and the system (ISO 14040, 2006), and their definition is fundamental in order to be able to identify and calculate mass and energy flows in these boundaries. This study is limited downstream by final product transport (distribution) and upstream limited by the process of extraction, processing and transport of raw materials.

4.3 Assignments

The industrial unit manufactures several monoporous products with different dimensions and shapes, but given that the product is the same at the exit of the oven, that is, by mass the product is the same, there was no need to use allocation or allocation procedures.

4.4 Geographic and temporal representativeness

The dataset used to model the production process is, whenever possible, based on specific Portuguese data, since it is produced in this country, or whenever it is not possible, average European data.

The temporal representativeness is based on the data sets used in the Ecoinvent v3.3 database (most recent at the time of the preparation of the EPD), with the update of the Portuguese electric mix to the year 2018. The specific data of the manufacturer refer to average production in 2018.

The data set used to model the upstream production processes and the process itself reflect the physical reality and the technology used. For each process/material used in the process modeling, data sets representative of the technologies used were used.

4.5 Variability of results

Not applicable, since the manufactured product represents only a single industrial unit (average of the manufactured coating products).

5 Life Cycle Assessement Results

5.1 Environmental impacts

Impact category	*Parameter*	*Unit*	*Results (per m² of ceramic tile) A1-A3*
			Aradas
Abiotic Resource Depletion (Elements)	Depletion potential (ADP-elements) for non-fossil abiotic resources	kg de Sb equiv.	4,62E-07
Depletion of abiotic resources (fossils)	Depletion potential (ADP-fossil fuels) for fossil abiotic resources	MJ, lower calorific value	1,51E+02
Soil and water acidification	Soil and water acidification potential, AP	kg SO_2 equiv.	3,50E-02
Ozone layer depletion	Stratospheric ozone layer depletion potential, ODP	kg de CFC 11 equiv.	1,29E-06
Global warming	Global Warming Potential, GWP	kg de CO_2 equiv.	1,03E+01
Eutrophication	Eutrophication Potential, EP	kg de $(PO_4)^{3-}$ equiv.	3,79E-03
Photochemical ozone formation	Tropospheric ozone formation potential, POCP	kg de Ethene equiv.	3,50E-02

5.2 Resource utilization

Parameter	***Unit***	***Results (per m² of ceramic tile) A1-A3***
		Aradas
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	MJ, lower calorific value	8,16E+00
Use of renewable primary energy resources used as raw materials	MJ, lower calorific value	6,75E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, lower calorific value	1,49E+01
Non-renewable primary energy use excluding non-renewable primary energy resources used as raw materials	MJ, lower calorific value	1,58E+02
Utilization of non-renewable primary energy resources used as raw materials	MJ, lower calorific value	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, lower calorific value	1,58E+02
Use of secondary material	kg	-
Use of renewable secondary fuels	MJ, lower calorific value	-
Use of non-renewable secondary fuels	MJ, lower calorific value	-
Net use of freshwater	m^3	1,71E+00

5.3 Waste

Parameter	***Unit***	***Results (per m² of ceramic tile) A1-A3***
		Aradas
Hazardous waste disposed of	kg	2,13E-04
Non-hazardous waste disposed of	kg	0,00E+00
Radioactive waste disposed of *	kg	2,00E-04

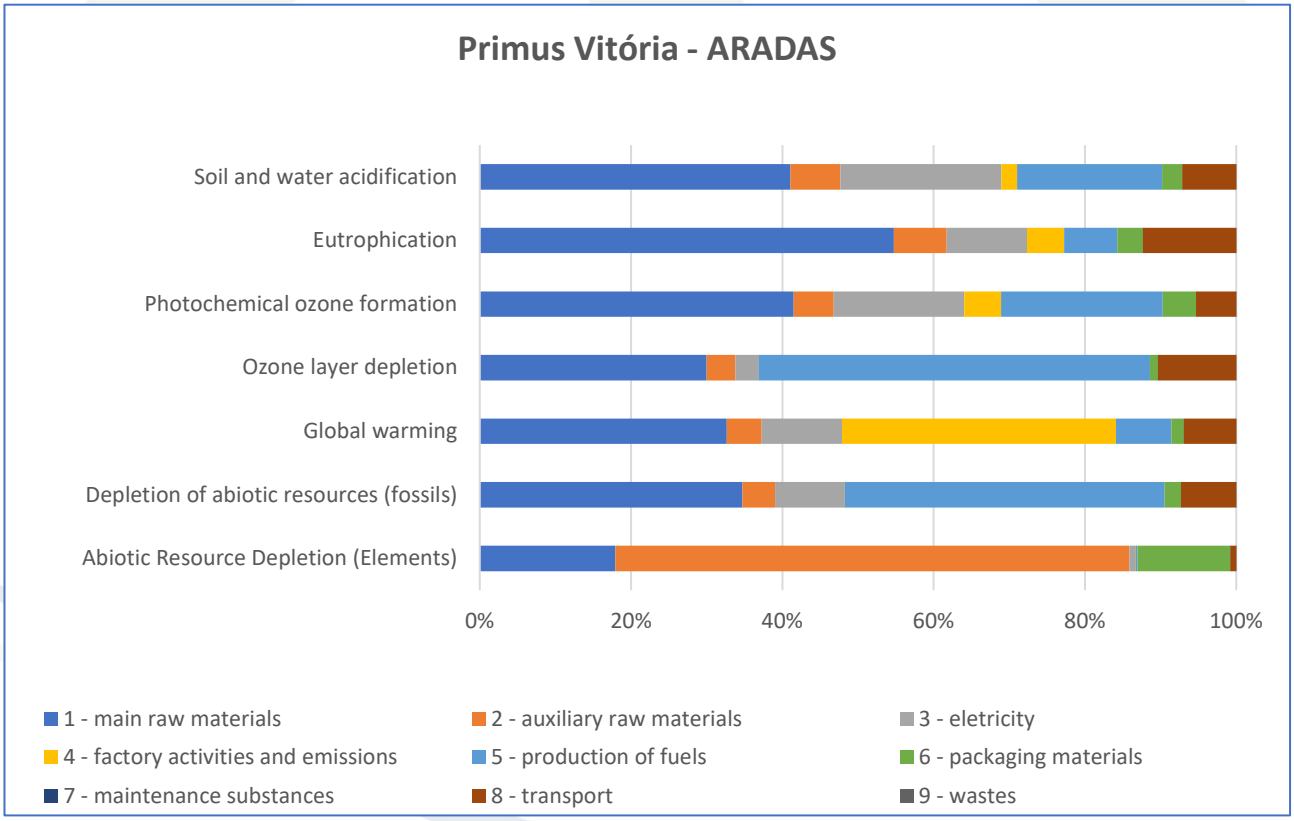
* The radioactive waste component does not come from the activity of PRIMUS VITÓRIA (A3). It is a component derived from the upstream activities (A1 and A2), namely the production of electricity.

5.4 Other information

Parameter	*Unit*	*Results (per m² of ceramic tile) A1-A3*
		Aradas
Components for reuse	kg	N/A
Materials for recycling	kg	1,38E-03
Materials for energy recovery	kg	N/A
Energy supplied abroad	MJ by energetic vector	N/A

5.5 Other information

The following figure shows the main contributors to the different impact categories.



6 Additional information

This plant has a quality management system implemented and certified according to ISO 9001: 2015.

Environmental policy

PRIMUS VITÓRIA continues with an active policy in the area of the environment, whose main objective is related to Environmental Sustainability.

The company bets on the adoption of a responsible and proactive behavior, considering the preservation of the environment as an indispensable factor in the conduct of its business and its economic evolution.

PRIMUS VITÓRIA's Environmental Policy aims at the following objectives:

- Continuous improvement of the environmental performance of its activities, products and services, and prevention of pollution;
- Compliance with applicable environmental legislation and preparation for future regulation, as well as compliance with other relevant requirements;
- Adoption of good environmental practices by its employees;
- Satisfying consumers' environmental concerns.

PRIMUS VITÓRIA is committed to playing an active role in the communities where it operates, collaborating with business partners, authorities and institutions in protecting the environment, with responsibilities in terms of sustainable development.

Recycling and reusing resources

The company optimizes all its resources, proceeding to recycling / reusing them, namely:

- Recycles 15,000 m^3 of water per year, which is sufficient to use in 2 343 750 toilet flushes and 187 500 showers;
- Recycles 1 500 tonnes of ceramic waste annually, enough to produce 1 100 tonnes of gravel, used to build 785 m of a 28-meter-wide highway;
- In 2018, the company, at the Aradas plant, recycled 15,32 tonnes of paper and cardboard, which allows avoiding the felling of about 268 trees per year, saving gas and water consumption;
- PRIMUS VITÓRIA - Aradas plant recycled around 1,7 tons of plastic in 2018, which allowed fuel savings of around 220 kg of oil.

Energy

At PRIMUS VITÓRIA, modern equipment with speed control (VVE) is used in the largest machines, which allows savings of 10 to 30% in the installation's electrical energy consumption.

In terms of energy, an investment was made in high efficiency burners in order to reduce energy consumption in the oven and in 2018 the placement of internal and external LED lighting was awarded.

7 References

- ✓ **Base de dados da Ecoinvent v3.3** (2018) (em www.ecoinvent.org)
  Direção Geral de Energia e Geologia (DGEG) - Dados mensais de Energia Elétrica (2018). (em http://www.dgeg.gov.pt/default.aspx?cn=689170027071AAAAAAAAAAAA)
- ✓ **Direção Geral de Energia e Geologia (DGEG)** – Energia em Portugal (2018)
- ✓ **EN 15942:2011** Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- ✓ **NP EN 15804:2012+A1:2015** Sustentabilidade das obras de construção – Declarações ambientais de produtos – Regras de base para as categorias de produtos de construção;
- ✓ **NP ISO 14025** Rótulos e declarações ambientais – Declarações ambientais Tipo III – Princípios e procedimentos;
- ✓ **Regras para a Categoria de Produto (RCP) - Modelo Base para Produtos e Serviços de Construção.** Sistema DAPHabitat. Versão 2.0, setembro 2015 (em www.daphabitat.pt);
- ✓ **Regras para a Categoria de Produto (RCP) - Revestimento de Paredes**. Sistema DAPHabitat. Versão 1.0, fevereiro 2014 (em www.daphabitat.pt);
- ✓ **Redes Energéticas Nacionais (REN)** – Centro de Informação - Estatísticas Mensais (2018). (em http://www.centrodeinformacao.ren.pt/PT/InformacaoExploracao/Paginas/EstatisticaMensal.aspx)