

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	Revirgrés
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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## Glazed and Unglazed Porcelain Tiles Revirgrés

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ECO PLATFORM

**EPD**  
VERIFIED



## 1. General Information

<p>Revigrés</p> <hr/> <p><b>Programme holder</b> IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p><b>Declaration number</b> EPD-REV-20170004-IAC1-EN</p> <hr/> <p><b>This Declaration is based on the Product Category Rules:</b> Ceramic tiles and panels, 07.2014 (PCR tested and approved by the SVR)</p> <hr/> <p><b>Issue date</b> 23/05/2017</p> <hr/> <p><b>Valid to</b> 22/05/2023</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p style="text-align: center;"></p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p><b>Glazed and Unglazed Porcelain Tiles</b></p> <hr/> <p><b>Owner of the Declaration</b> <b>Revigrés</b> Apartado 1, 3754-001 Barrô, Águeda, Portugal</p> <hr/> <p><b>Declared product / Declared unit</b> Glazed and Unglazed Porcelain Tiles/ 1 m<sup>2</sup> of ceramic tiles</p> <hr/> <p><b>Scope:</b> This declaration for ceramic tiles is an average EPD which represents the production of all products from series CREMA, CROMÁTICA, DUAL, EXOTIC, FLINT, GLOBE, LIGHT, PIGMENTO, STEEL, XISTO, YURA and products with a similar composition and manufacturing process. The results presented in this EPD are from a representative product, STEEL, which was the product with the highest impacts, from the sample of products analyzed. These products are all manufactured in a single location at Barrô (Águeda, Portugal).  The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.</p> <hr/> <p><b>Verification</b></p> <table border="1"> <tr> <td colspan="2">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration according to /ISO 14025/</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p style="text-align: center;"></p> <hr/> <p>Mr Olivier Muller (Independent verifier appointed by SVR)</p>	The CEN Norm /EN 15804/ serves as the core PCR		Independent verification of the declaration according to /ISO 14025/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
The CEN Norm /EN 15804/ serves as the core PCR							
Independent verification of the declaration according to /ISO 14025/							
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## 2. Product

### 2.1 Product description / Product definition

The declared products are representative for glazed and unglazed porcelain tiles produced at Revigrés, combining technological innovation with good environmental practices.

The Revigrés glazed and unglazed tiles can be used indoors and outdoors, in both public and residential areas.

They have extremely low water absorption, no more than 0,05%, are waterproof and high stain resistance, allowing different visual effects and colours.



For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The

product needs a Declaration of Performance taking into consideration /EN 14411:2012 Ceramic tiles — Definitions, classification, characteristics, evaluation of conformity and marking/ and the CE-marking. For the application and use the respective national provisions apply.

### 2.2 Application

These products are adequate for all types of use, namely:

- Wall and floor covering (Interior and exterior);
- Public and residential areas.

### 2.3 Technical Data

The data of the Declaration of Performance apply. The products are manufactured to comply with the product requirements specifications of EN 14411 Group B1a.

The ceramic tiles conform to the following standards and specifications:

#### Constructional data

Name	Value	Unit
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Water absorption ISO 10545-3	< 0,05	%
Rupture modulus ISO 10545-4	> 35	N/mm <sup>2</sup>
Bending Strength: Thickness ≥ 7,5 mm ISO 10545-4	> 1500	N
Bending Strength: Thickness < 7,5 mm ISO 10545-4	> 700	N
Resistance to deep abrasion for Unglazed Tiles ISO 10545-6	< 160	Removed volume/ mm <sup>3</sup>
Resistance surface abrasion (PEI value) for Glazed Tiles	I-II-III-IV-V (a)	
Coefficient of Linear Thermal Expansion (with atmospheric temperature up to 100 °C) ISO 10545-8	≤ 8,0x10 <sup>-6</sup>	/ °C
Resistance to thermal shock ISO 10545-9	Resistant	-
Resistance to frost ISO 10545-12	Without visible defects	-
Resistance to Acids and Bases ISO 10545-13	Unglazed Tiles: From ULA ULA (No visible effect) /ULB (visible effects on the cut sides) and Glazed Tiles	-
Resistance to Household Chemicals and Swimming pool ISO 10545-13	Unglazed Tiles: Min UA (No visible effect) and Glazed tiles: Min GA (No visible effect)	-
Stain Resistance ISO 10545-14	Min. Class 3 (Stain removed with strong cleaner)	-
Skid Resistance Pendulum DIN 51130	No classification; CLASS 1-2-3 and NC; PTV>36	-
Skid Resistance Ramp Method DIN 51097	No classification; A-B-C and NC; R9-R10-R11-R12-R13	-
Resistance to heavy shock UPEC CSTB 3755	Min. Level 3 (Heavy Residential)	-

(a) Resistance to abrasion (PEI Groups):  
- Light Traffic Tiles

- Floor Tiles for light traffic areas. (Equivalent to PEI II / G2)
- Floor Tiles for regular traffic areas. (Equivalent to PEI III / G3)
- Floor Tiles for areas of considerable traffic. (Equivalent to PEI IV / G4)

#### 2.4 Delivery status

The dimensions vary according to the customers demand:

- Length from 7 to 120 cm;
- Width from 5 to 90 cm;
- Thickness varies between 5mm and 14 mm depending on the product properties.

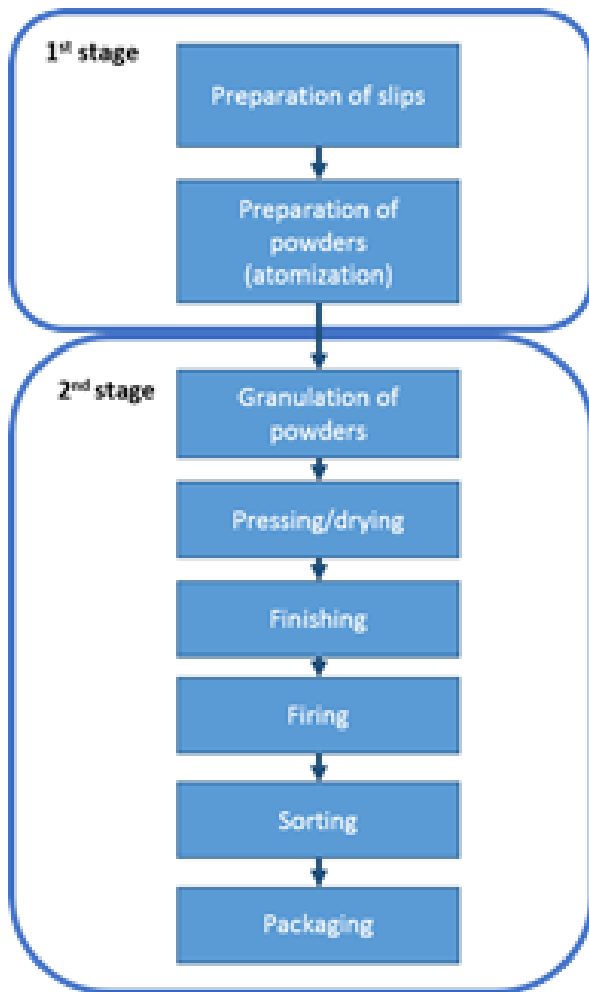
#### 2.5 Base materials / Ancillary materials

Ceramic tiles are mainly made of raw natural material such as clay, kaolin, feldspar, silica sand. The finishing product includes frits, pigments, binders, and other auxiliary substances/additives like dispersant, pigment, binder and rheological additives.

#### 2.6 Manufacture

The production process is divided into 2 major stages:

- 1<sup>st</sup> stage: Consists in the preparation of the ceramic slips (turbo dilution, and continuous and discontinuous grinding), followed by the preparation of powders (atomization);
- 2<sup>nd</sup> stage: Granulation of powders (power mix and micronization), pressing/drying, application of finishes, firing, sorting and packaging.



## 2.7 Environment and health during manufacturing

There are no environmental nor health issues that should be addressed during the manufacturing stage of the analyzed products.

## 2.8 Product processing/Installation

The tiles are fixed to the surface using an appropriate cement glue.

The glue should be spread on the support and back of the piece. When settling the pieces, these should be placed slightly apart from their position and dragged to their final position. To tap the tiles and ensure that the adhesive cords have been crushed properly, it is advised to use the white rubber mallet.

Do not use black rubber mallets as they may leave marks. To cut the tiles, an electric cutter with a water-cooled diamond wheel or a manual cutter with a Widia scoring wheel should be used .

## 2.9 Packaging

The usual materials used for packaging the products are plastic straps, cardboard boxes, plastic film and wooden pallets. Wood pallets can be reused over again. Plastic straps, plastic film and cardboard boxes can be recycled.

## 2.10 Condition of use

For everyday cleaning, water (preferably tepid) and a neutral detergent are used to clean the tiles.

## 2.11 Environment and health during use

There are no environmental nor health issues that should be considered during the use stage of the analyzed products.

## 2.12 Reference service life

This EPD is relevant to cradle-to-factory gate with options and therefore no reference to useful life is required.

No negative impacts on ageing are known when applied in accordance with the rules of technology.

## 2.13 Extraordinary effects

### Fire

Fire performance according to /Decision 96/603/CE/ of Glazed and Unglazed Tiles is Type A1.

### Water

There are no environmental impacts on water identified in the use stage of the product since the product is mainly composed by natural materials that are not hazardous to water masses.

### Mechanical destruction

There is no potential harm to health and environment known resulting from mechanical destruction of the product.

## 2.14 Re-use phase

The product is mainly composed of fired clay and other minerals. The product itself can be reused when performing renovations or dismantling a building. Considering this fact, it can enter again in the production process in order to be incorporated in products including recycled content and used as aggregate too.

## 2.15 Disposal

According to the /European Waste Catalogue Directive/ the used floor covering can be classified in the main category "17 Construction and Demolition Waste (including road construction)".

Considering the specific constitution of this floor covering, and assuming that the layers cannot be separated at the end of life, the waste code applied is the following:

17 09 04 Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03

These types of waste materials can be recovered according to the /European Waste Framework Directive/.

## 2.16 Further information

N/A

## 3. LCA: Calculation rules

### 3.1 Declared Unit

The results of the LCA provided have been calculated from the product with the highest environmental impact (worst-case scenario) within the product group, the

product Steel. Thus, the results of the LCA provided have been calculated from the product with the highest environmental impact (worst-case scenario) within the product group, the product Steel. Thus, the declared

unit is 1 m<sup>2</sup> ceramic tile with a weight of 27,20 kg, corresponding to Steel.  
The densities and thicknesses of each product are indicated in the table below:

Products	Density of ceramic tile (kg/m <sup>2</sup> )	Thickness (cm)
CREMA MARFIL	25,5	0,85
CROMÁTICA PRETO	25,5	0,85
DUAL MARFIL	24,7	0,85
EXOTIC BRANCO	27,2	0,98
FLINT ARG PRATA	25,5	0,85
GLOBE CORDA	25,5	0,85
LIGHT COPPER	16,7	0,6
PIGMENTO CHUMBO	21,7	0,7
STEEL	27,2	0,98
XISTO PRETO	27,2	0,85
YURA CINZA	25,5	0,85

#### Declared unit

Name	Value	Unit
Declared unit	1	m <sup>2</sup>
Grammage	27.2	kg/m <sup>2</sup>
Conversion factor to 1 kg	0.036	-

#### 3.2 System boundary

Type of the EPD: cradle to gate. This EPD includes the stage A1-A3 - Production Stage: Includes the production phase of all the products and materials used in the product, the transport of these materials from the suppliers to the industrial unit of Revigrés and the production stage of Glazed and Unglazed tiles.

#### 3.3 Estimates and assumptions

Information on components and average weight percentage of glazes, pigments and frits was obtained from their technical data sheets and some had to be considered an average dataset of /Ecoinvent v3/.

#### 3.4 Cut-off criteria

All available data associated directly to the manufacture of the product was included in the LCA, with the exception of infrastructure and buildings. Hence, the study complies with the cut-off criteria of 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process.

#### 3.5 Background data

Specific data was used based on average production of 2014. For processes, where the producer has no influence or specific information on, like the extraction of raw materials, generic data from the following main sources were considered:

- /Ecoinvent 2.0/
- /Ecoinvent 3.0/
- /PRé Consultants/

#### 3.6 Data quality

Specific data is referred to production of 2014. Data sets of processes from /Ecoinvent/ database are less than 8 years old. Data sets are based on literature and average data from specific industrial units. Regarding geography coverage, whenever possible an average European data and Portugal specific energy mix was used. In cases where no average European data was available, the most approximate data set was used. Considering these aspects, the data used in this study is considered of high quality.

#### 3.7 Period under review

The specific data collected from the manufacturer refer to the year of 2014.

#### 3.8 Allocation

Energy, water, wastewater and air emissions allocated to this product were determined by the manufacturer, considering the different processes involved in the production of the product.

#### 3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

## 4. LCA: Scenarios and additional technical information

N/A

## 5. LCA: Results

### DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	MND	MND	MND

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m<sup>2</sup> of Glazed and Unglazed Porcelain Tiles

Parameter	Unit	A1-A3
Global warming potential	[kg CO <sub>2</sub> -Eq.]	2.41E+1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	3.01E-6
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	1.08E-1
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	1.03E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	4.64E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	4.39E-5
Abiotic depletion potential for fossil resources	[MJ]	3.70E+2

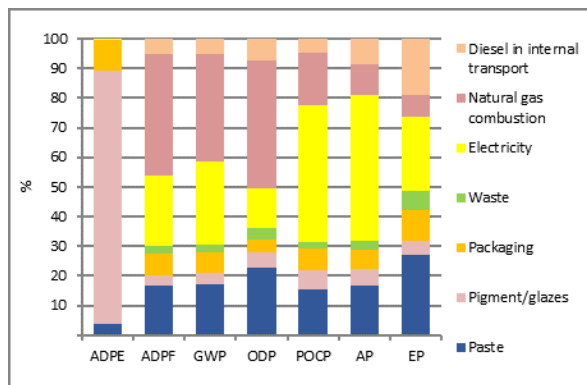
### RESULTS OF THE LCA - RESOURCE USE: 1 m<sup>2</sup> of Glazed and Unglazed Porcelain Tiles

Parameter	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	2.20E+1
Renewable primary energy resources as material utilization	[MJ]	4.21E+0
Total use of renewable primary energy resources	[MJ]	2.62E+1
Non-renewable primary energy as energy carrier	[MJ]	3.54E+2
Non-renewable primary energy as material utilization	[MJ]	8.76E+0
Total use of non-renewable primary energy resources	[MJ]	3.63E+2
Use of secondary material	[kg]	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0
Use of net fresh water	[m <sup>3</sup> ]	2.20E+1

### RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m<sup>2</sup> of Glazed and Unglazed Porcelain Tiles

Parameter	Unit	A1-A3
Hazardous waste disposed	[kg]	4.29E-4
Non-hazardous waste disposed	[kg]	3.54E+0
Radioactive waste disposed	[kg]	1.07E-3
Components for re-use	[kg]	0.00E+0
Materials for recycling	[kg]	1.57E+0
Materials for energy recovery	[kg]	0.00E+0
Exported electrical energy	[MJ]	0.00E+0
Exported thermal energy	[MJ]	0.00E+0

## 6. LCA: Interpretation



Within the products covered by this EPD (Glazed and Unglazed Porcelain tiles), the values of the environmental impacts are between 42% and 100% of the value for STEEL, except for ADPE, in which the values are between 4% to 435% of the impacts of this product and EP, with values between 43% and 127%.

**ADPE (Abiotic depletion element):** The main impacts in this category are associated to the pigments. All the products have their impacts related primarily to the use of lead, since they all use the average dataset for frits.

**ADPF (Abiotic depletion fossil fuels):** These impacts are directly related to the use of fossil fuels. Electricity, natural gas and pastes. The impacts of paste are mainly associated to the use of diesel in transport of clay.

**GWP (Global warming potential):** Electricity, natural gas and the pastes are the components with the



highest impacts. These impacts are due to carbon dioxide and methane linked to combustion processes of fossil fuels.

**ODP (Ozone layer potential):** These impacts are associated primarily to the use of pastes, followed by electricity and diesel. The use of natural gas, petroleum and heavy fuel oil result in emission of halons and CFCs into the atmosphere.

**POCP (Photochemical oxidant creation potential):** This category is influenced by electricity, natural gas and pastes. The impacts related to electricity are mostly linked to production of natural gas and the frit used, which results in emission for sulfur dioxide and carbon monoxide.

**AP (Acidification potential):** The majority of the impacts in this category are associated to electricity consumption. The combustion process of fossil fuels used in electricity production results in emission of sulfur dioxide, nitrogen oxides and ammonia, which are the main responsible for these impacts.

**EP (Eutrophication potential):** These impacts are linked to the use of electricity, pastes, diesel, natural gas, wood box in packaging and waste production. The impacts are associated to the emission of nitrogen oxides during the production process and the wastewater released associated to the production process of wood boxes.

## 7. Requisite evidence

No evidence is provided along with the EPD for the Ceramic Tiles product group, since there are no requirements regarding evidence as stated in the PCR

Part B – Requirements on the EPD for ceramic tiles and panels.

## 8. References

### PCR 2015, Part A, version 1.4

Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. September 2015 ([www.bau-umwelt.de](http://www.bau-umwelt.de))

### PCR 2014, Part B, version 1.6

Institut Bauen und Umwelt e.V., Königswinter (pub.): PCR Guidance-Texts for Building-Related Products and Services From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), Part B: Requirements on the EPD for Floor coverings, July 2014 ([www.bau-umwelt.de](http://www.bau-umwelt.de))

### /BS 7976-2:2002+A1:2013/

/BS 7976-2:2002+A1:2013/, Pendulum testers. Method of operation

### British Ceramic Research Association LTD

British Ceramic Research Association LTD: Method for determination of the coefficient of friction of floor tiles and floor surfaces

### /DIN 51097/

/DIN 51097:1992-11/, Testing of floor coverings; determination of the anti-slip properties; wet-loaded barefoot areas; walking method; ramp test

### /DIN 51130/

/DIN 51130/, Testing of floor coverings; determination of slip resistance; work rooms and work areas subject to higher risk of slipping.

### /Ecoinvent version 2.0/

/Ecoinvent version 2.0/, ecoinvent, 2007

### /Ecoinvent version 3.0/

/Ecoinvent version 3.0/, ecoinvent, May 2013

### /UNE EN ENV 12633:2003 /

/UNE ENV 12633/, Method of determination of unpolished and polished slip/skid resistance value

### /EN 13036-4:2011/

/BS EN 13036-4:2011/, Road and airfield surface characteristics. Test methods. Method for measurement of slip/skid resistance of a surface: The pendulum test

### /EN 14411:2012/

/EN 14411:2012/, Ceramic tiles. Definitions, classification, characteristics, evaluation of conformity and marking

### European Waste Framework Directive/

Waste Framework Directive (WFD) (2008/98/EC)

### European Waste Catalogue Directive

European Waste Catalogue (EWC) (Commission Decision 94/3/EC)

### European List of Waste

European List of Waste (ELW) (Commission Decision 2000/532/EC)

### /DEVL1104875A/

/DEVL1104875A/, Arrêté du 19 avril 2011 relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils

### /DIN 51130/

/DIN 51130/, Testing of floor coverings – Determination of the anti-slip properties – Workrooms and fields of activities with slip danger, walking method – Ramp test

### /DIN 51097/

/DIN 51097/, Testing of floor coverings; determination of slip resistance; barefoot areas exposed to wet.

### /ISO 10545:2014/

/ISO 10545:2014/, Ceramic tiles

### /ISO 10545-3/

/ISO 10545-3:1995/, Ceramic tiles -- Part 3: Determination of water absorption, apparent porosity, apparent relative density and bulk density

**/ISO 10545-4/**

ISO 10545-4:2004/, Ceramic tiles -- Part 4:  
Determination of modulus of rupture and breaking  
strength

**/ISO 10545-6/**

ISO 10545-6:2010/, Ceramic tiles -- Part 6:  
Determination of resistance to deep abrasion for  
unglazed tiles

**/ISO 10545-7/**

ISO 10545-7:2010/, Ceramic tiles -- Part 7:  
Determination of resistance to surface abrasion for  
glazed tiles

**/ISO 10545-8/**

ISO 10545-8:2014/ - Ceramic tiles -- Part 8:  
Determination of linear thermal expansion

**/ISO 10545-9/**

ISO 10545-9:2013/ Ceramic tiles -- Part 9:  
Determination of resistance to thermal shock

**/ISO 10545-12/**

ISO 10545-12:1995/ Ceramic tiles -- Part 12:  
Determination of frost resistance

**/ISO 10545-13/**

ISO 10545-13:1995/, - Ceramic tiles -- Part 13:  
Determination of chemical resistance

**/ISO 10545-14/**

ISO 10545-14:2015/ - Ceramic tiles -- Part 14:  
Determination of resistance to stains

**/ISO 13006:2012/**

ISO 13006:2012/: Ceramic tiles -- Definitions,  
classification, characteristics and marking

**NF UPEC (CSTB)/ NF029 Marque NF**

NF UPEC (CSTB)/ NF029 Marque NF/ carreaux  
céramiques pour revêtements sol associée à la marque  
UPEC;

**/NP EN 14411:2008/**

/NP EN 14411:2008/, Ceramic tiles. Definitions,  
classification, characteristics and marking.

**/NP EN ISO 9001:2008/**

/NP EN ISO 9001:2008/, Quality management system

**/NP EN ISO 14001:2012/**

/NP EN ISO 14001:2012/, Environmental management  
systems -- Requirements with guidance for use

**/NP 4469-1:2008/**

/NP 4469-1:2008/, Social accountability management  
system

**/NP 4457:2007/**

/NP 4457:2007/, Requirements of RDI management  
system

**/NP EN ISO 9001:2008/**

/NP EN ISO 9001:2008/, Quality management systems  
– Requirements

**/NP EN ISO 14001:2012/**

/NP EN ISO 14001:2012/, Environmental management  
systems -- Requirements with guidance for use

**/UPEC CSTB 3755/**

/UPEC CSTB 3755/, Resistance to heavy shock

**Institut Bauen und Umwelt**

Institut Bauen und Umwelt e.V., Berlin(pub.):  
Generation of Environmental Product Declarations  
(EPDs);  
[www.ibu-epd.de](http://www.ibu-epd.de)

**ISO 14025**

DIN EN ISO 14025:2011-10: Environmental labels and  
declarations — Type III environmental declarations —  
Principles and procedures

**EN 15804**

EN 15804:2012-04+A1 2013: Sustainability of  
construction works — Environmental Product  
Declarations — Core rules for the product category of  
construction products



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DESIGN EM CERÂMICA

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