EPD

CERTIFICATION

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RAK CERAMICS

RAK Ceramics - Al Jazirah Al Hamra Factory

Ceramic & Porcelain Tiles

Environmental
Product
Declaration

1. General Information

Manufacturer Name:	RAK Ceramics - Al Jazirah Al Hamra Factory Sheikh Muhammad Bin Salem Rd, Al Jazirah Al Hamra Ras al Khaimah, United Arab Emirates
Program Operator:	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959, USA
Declaration Number:	XXXX
Reference PCR:	IBU PCR Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report – Version 1.7 IBU PCR Part B: Requirements on the EPD for Ceramic tiles and panels – Version 1.1
Date of Issuance:	August 2020
End of Validity:	June 2025
Product Name:	Ceramic tile / Porcelain tile
EPD Owner:	RAK Ceramics
Product Group:	Ceramic tiles and panels
Declared Unit:	1 m^2 of ceramic tiles
EPD Scope:	Cradle-to-gate (A1, A2, and A3)
Verification:	The CEN Norm EN 15804 serves as the core PCR. Independent verification of the declaration according to ISO 14025 and ISO 21930. ☐ internal ☒ external
LCA Reviewer and EPD Verifier:	Timothy S. Brooke ASTM International

ASTM INTERNATIONAL

2. Product

2.1 Product Description
The declared products are ceramic tiles and porcelain tiles produced by RAC Ceramics. Since tiles are available in various sizes, this EPD represents two average products.

2.2 Application
Ceramic and porcelain tiles are used for floor and wall applications.

2.3 Technical Data
Information not available.

2.4 Delivery Status
Information not available.

2.5 Base Materials

Table 2: Product Ingredients

Product	Ingredient Name	Value	
Ceramic Tile	Qamar Clay	64	%
	Limestone	7	%
	Silica Red Sand	10	%
	Shale Clay	6	%
	Bentonite	4	%
	Green Tiles Scrap Materials	5	%
	Glaze & Pigments	5	%
Porcelain Tile	Potash	45	%
	Sand	6	%
	Sand Mix FC Ball Clay	40	%
	Hycast VC Ball Clay	2	%
	DS Kaolin	2	%
	TP Prosper Clay	5	%

2.6 Manufacture
Tile products are mixtures of predominantly clay and other natural occuring minerals that have been mixed with water and fired in a high temperature kiln.

2.7 Environment and Health Considerations during Manufacturing
Information not available.

2.8 Product Processing/Installation
The product is installed in a manner and with equipment that is specific to the application for which it was purchased.

2.9 Packaging
Information about packaging was not available from the manufacturer. It is assumed that the total mass of packaging is below 1% of the total mass, and therefore cut off.

2.10 Conditions of Use
Not applicable: Use phase is outside the scope of the underlying LCA.

2.11 Environment and Health Considerations During Use
Not applicable: Use phase is outside the scope of the underlying LCA.

2.12 Reference Service Life
Not applicable: Use phase is outside the scope of the underlying LCA.

2.13 Extraordinary Effects
No extraordinary effects are reported in this EPD.

2.14 Re-use Phase
Not applicable: End-of-life phase is outside the scope of the underlying LCA.

2.15 Disposal
Not applicable: End-of-life phase is outside the scope of the underlying LCA.

2.16 Further Information
No further information is reported in this EPD.

3. LCA Calculation Rules

3.1 Declared Unit

The declared unit is one square meter of ceramic/porcelain tile product produced at RAK Ceramics' Al Jazirah Al Hamra Factory.

3.2 System Boundary

The system boundary for this study is limited to a cradle-to-gate focus. The following three life cycle stages as per the governing PCRs are included in the study scope (see also Table 4):

A1 Raw material supply (upstream processes): Extraction, handling, and processing of input materials.
A2 Transportation*:* Transportation of all input materials from the suppliers to the gate of the manufacturing facility.
A3 Manufacturing (core process): The preparation processes of tile products at RAK Ceramics' Al Jazirah Al Hamra Factory. This phase also includes the operations of the manufacturing facility and all process emissions that occur at the production facility.

3.3 Estimates and Assumptions

All significant foreground data was gathered from the manufacturer based on measured values (i.e. without estimation).

3.4 Cut-off Criteria

The cut-off criteria for all activity stage flows considered within the system boundary conform with ISO14044:2006 and section 6 of the IBU PCR Part A:

- All inputs and outputs to a (unit) process were included in the calculation for which data is available. Data gaps were filled by conservative assumptions with average or generic data. Any assumptions for such choices were documented.
- In case of insufficient input data or data gaps for a unit process, the cut-off criteria were 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows, e.g. per module A1-A3 were a maximum of 5% of energy usage and mass. Conservative assumptions in combination with plausibility considerations and expert judgement were used to demonstrate compliance with these criteria.
- Particular care was taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this standard. Conservative assumptions in combination with plausibility considerations and expert judgement were used to demonstrate compliance with these criteria.

3.5 Background Data and 3.6 Data Quality

Data was gathered for the primary material and energy inputs used in the production of the tile products for calendar year 2019. Table 3 describes each LCI data source for raw materials (A1), transportation by mode (A2) and the core manufacture process (A3). Table 3 also includes a data quality assessment for all secondary data on the basis of the technological, temporal, and geographical representativeness as per the IBU PCR.

Table 3: Secondary Data Sources and Data Quality Assessment

A1: Raw Material Inputs

Inputs	LCI Data Source	Geography	Year	Data Quality Assessment
Quamar Clay **Shale Clay** **Ball Clay**	Clay {RoW}| market for clay | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Limestone	Limestone, crushed, washed {RoW}| market for limestone, crushed, washed | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Sililca Red Sand	Silica sand {GLO}| market for | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Soda Feldspar **Potash Feldspar**	Feldspar {GLO}| market for | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.

Bentonite	Bentonite {GLO}| market for | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Dolomite	Dolomite {RoW}| market for dolomite | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Glaze	Frit, for ceramic tile {GLO}| market for | Cut-off, U	Global	2014	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.

A2: Transportation

Inputs	LCI Data Source	Geography	Year	Data Quality Assessment
Truck transport	Transport, freight, lorry 16-32 metric ton, EURO4 {RoW}| transport, freight, lorry 16-32 metric ton, EURO4 | Cut-off, U	Global	2014	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Ocean transport	Transport, freight, sea, transoceanic tanker {GLO}| market for | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.

A3: Manufacturing

Energy	LCI Data Source	Geography	Year	Data Quality Assessment
Grid Electricity	Electricity, high voltage {AE}| market for electricity, high voltage | Cut-off, U	UAE	2014	**Technology**: very good Process models average UAE technology **Time:** good Data is <10 years old **Geography**: very good Data is representative of UAE electricity.

Diesel Electricity	Diesel, burned in diesel-electric generating set {GLO}| market for | Cut-off, U	Global	2011	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Natural Gas	Heat, district or industrial {RoW}| market for heat, district or industrial, natural gas | Cut-off, U	Global	2015	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.
Water	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Freshwater	Tap water {RoW}| market for | Alloc Rec, U	Global	2014	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Recycled water	Wastewater from ceramic production {RoW}| treatment of, capacity 5E9l/year | Cut-off, U	Global	2010	**Technology:** very good **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Waste	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Tiles Scrap Waste	Inert waste, for final disposal {RoW}| treatment of inert waste, inert material landfill | Cut-off, U	Global	2010	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.
Industrial Waste (Plastic, Wood, Cardboard)	Municipal solid waste {RoW}| treatment of, sanitary landfill | Cut-off, U	Global	2010	**Technology:** very good Process models average global technology **Time:** good Data is <10 years old **Geography:** very good Data is representative of global conditions.

3.7 Period under Review

Data was gathered for the primary material and energy inputs used in the production for calendar year 2019.

3.8 Allocation

At RAK Ceramics' Al Jazirah Al Hamra factory several ceramic and sanitary ware products are produced. Since the primary data for manufacturing was only available on a facility level, the environmental load among the products produced is allocated according to its mass.
For waste that is recycled, the 'recycled content appraoch' was chosen. The recycling of waste generated by the product system is cut off.

3.9 Comparability

This LCA was created using industry average data for upstream materials. Data variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel types used.

4. LCA: Scenarios and additional technical information

The scope of this EPD is limited to modules A1-A3 and thus no additional scenario or technical information is applicable.

5. LCA: Results

Life cycle impact assessment (LCIA) is the phase in which the set of results of the inventory analysis – the inventory flow table – is further processed and interpreted in terms of environmental impacts and resource use inventory metrics. As specified in the IBU PCR, Table 4 and 5a/b below summmarizes the LCA results for the cradle-to-gate (A1-A3) product systems.

Table 4: Description of the System Boundary (x: included in LCA; mnd: module not declared)

Product			Construction Installation		Use							End-of-life				Benefits of Loads Beyond the System Boundary		
Raw Material supply	Transport	Manufacturing	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd

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Table 5a: Impact Assessment Results for 1 m^2 Ceramic Tile Product			
LCIA Indicators		**Unit**	**A1-A3 Total**
GWP	Global Warming Potential (climate change)	kg CO_2-eq	8.1436
ODP	Ozone Depletion Potential	kg CFC-11-eq	1.05E-06
AP	Acidification Potential	kg SO_2-eq	0.0220
EP	Eutrophication Potential	kg PO_4-eq	0.0077
POCP	Photochemical Ozone Creation/Smog Potential	kg C_2H_4 eq	0.0012
ADPE	Abiotic Depletion Potential for Non-Fossil Resources	kg Sb eq	2.92E-04
ADPF	Abiotic Depletion Potential for Fossil Resources	MJ	118.6482
Inventory Metrics – Resources			
PERE	Use of renewable primary energy as energy	MJ	2.3583
PERM	Use of renewable primary energy as a material	MJ	-
PERT	Total use of renewable primary energy	MJ	2.3583
PENRE	Use of non-renewable primary energy as energy	MJ	133.2152
PENRM	Use of non-renewable primary energy as a material	MJ	-
PENRT	Total use of non-renewable primary energy	MJ	133.2152
SM	Use of secondary materials	kg	-
RSF	Use of renewable secondary fuels	MJ	-
NRSF	Use of non-renewable secondary fuels	MJ	-
FW	Use of freshwater resources	m^3	0.0688
Inventory Metrics – Waste and Outputs			
HWD	Disposed of Hazardous Waste	kg	1.4839
NHWD	Disposed of Non-Hazardous Waste	kg	-
RWD	Disposed of Radioactive Waste	kg	6.13E-08
CRU	Components for Reuse	kg	-
MFR	Materials for Recycling	kg	-
MER	Materials for Energy Recovery	kg	-
EEE	Exported Electrical Energy (Waste to Energy)	kg	-
ETE	Exported Thermal Energy (Waste to Energy)	kg	-

Table 5b: Impact Assessment Results for 1 m^2 Porcelain Tile Product			
LCIA Indicators		**Unit**	**A1-A3 Total**
GWP	Global Warming Potential (climate change)	kg CO_2-eq	10.7149
ODP	Ozone Depletion Potential	kg CFC-11-eq	1.45E-06
AP	Acidification Potential	kg SO_2-eq	0.0446
EP	Eutrophication Potential	kg PO_4-eq	0.0110
POCP	Photochemical Ozone Creation/Smog Potential	kg C_2H_4 eq	0.0021
ADPE	Abiotic Depletion Potential for Non-Fossil Resources	kg Sb eq	3.07E-04
ADPF	Abiotic Depletion Potential for Fossil Resources	MJ	156.9078
Inventory Metrics – Resources			
PERE	Use of renewable primary energy as energy	MJ	2.9555
PERM	Use of renewable primary energy as a material	MJ	-
PERT	Total use of renewable primary energy	MJ	2.9555
PENRE	Use of non-renewable primary energy as energy	MJ	175.5320
PENRM	Use of non-renewable primary energy as a material	MJ	-
PENRT	Total use of non-renewable primary energy	MJ	175.5320
SM	Use of secondary materials	kg	-
RSF	Use of renewable secondary fuels	MJ	-
NRSF	Use of non-renewable secondary fuels	MJ	-
FW	Use of freshwater resources	m^3	0.0936
Inventory Metrics – Waste and Outputs			
HWD	Disposed of Hazardous Waste	kg	1.6323
NHWD	Disposed of Non-Hazardous Waste	kg	-
RWD	Disposed of Radioactive Waste	kg	1.35E-07
CRU	Components for Reuse	kg	-
MFR	Materials for Recycling	kg	-
MER	Materials for Energy Recovery	kg	-
EEE	Exported Electrical Energy (Waste to Energy)	kg	-
ETE	Exported Thermal Energy (Waste to Energy)	kg	-

6. Interpretation

Figure 1a and 1b shows the relative contribution to the cumulative impacts of the A1 through A3 phases of the cradle-to-gate life cycle.

For ceramic tiles, the manufacturing (A3) is the major contributor to GWP, ODP, POCP and ADPf. Major A3 impacts came from the combustion of natural gas for heat during the drying process. For the indicators AP, EP and ADPe, the major impacts occurred during the raw material supply (A1). Transportation (A2) impacts are insignificant for ceramic tiles.

In the porcelain tiles production, the impact of transportation is much higher and accounts for around 20% of the overall impact. This is due to longer transportation distances.

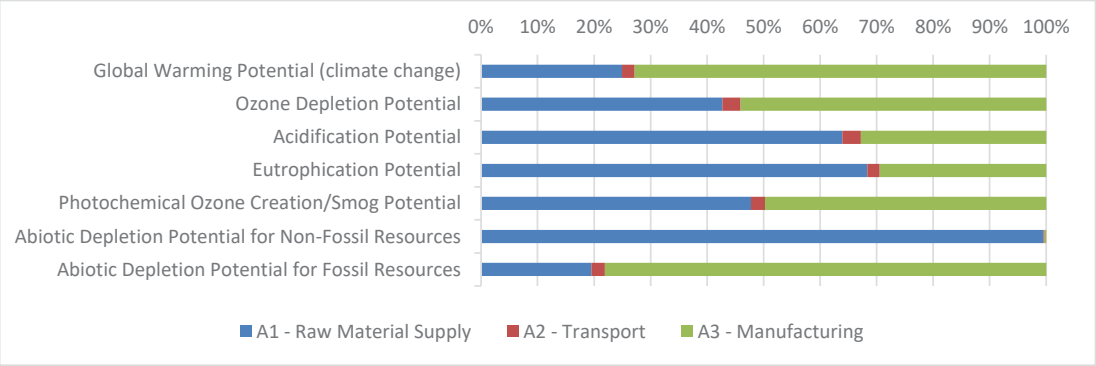

Figure 1a. Contribution analysis for ceramic tiles

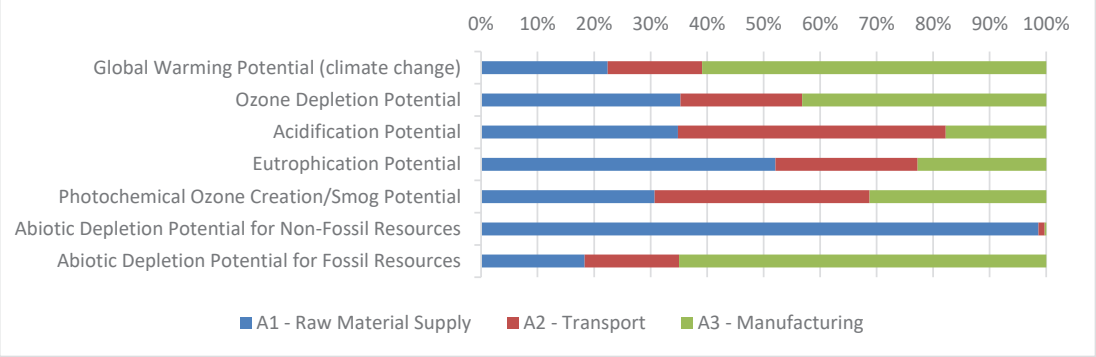

Figure 1b. Contribution analysis for porcelain tiles

7. Requisite Evidence

No environemental claims beyond the LCA results are made in this EPD and thus no additional evidence is required.

8. References

1. A Cradle-to-Gate Life Cycle Assessment of Ceramic Tiles and Sanitary Ceramics Manufactured by RAK Ceramics

2. EN 15804: 2012 Sustainability of construction works – Environmental product declarations –Core rules for the product category of construction products.

3. IBU PCR Part A: Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report – Version 1.7

4. IBU PCR Part B: Requirements on the EPD for ceramic tiles and panels, Version 1.1

5. ISO 21930: 2017 Building construction – Sustainability in building construction – Environmental declaration of building products.

6. ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.

7. ISO 14044: 2006 Environmental management - Life cycle assessment - Requirements and guidelines.

8. ISO 14040: 2006 Environmental management - Life cycle assessment - Principles and framework.