Solido E 160 and Solido E 225

Cement Self-Levelling Screeds
by BAUMIT Bulgaria EOOD

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1. General Information

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This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025. It contains information about the impact of declared construction materials on environment and their aspects verified by the independent Advisory Board according to ISO 14025.

Basically, a comparison, or evaluation of EPD data is possible only if all the compared data were created according to EN 15804.

Life Cycle analysis (LCA): Modules A1-A3, C1-C4 and Module D in accordance with EN 15804 (Cradle to Gate with options)

Declared durability: 50 years under normal conditions of use

Product standard: BDS EN 13813

PCR: ITB-EPD General PCR v1.4/2014

Representativeness: BG, RER, GLO

Declared unit: 1 ton of dry mix for cement self-levelling floating screeds

LCA scope: Product stage (modules A1-A3), End-of-life stage (C1-C4) and Benefits and loads beyond the system boundary (module D)

Year of preparing the characteristic: 2021

2. Product Description

BAUMIT SOLIDO E 160

BAUMIT Solido E 160 is a a factory-made, ready-mixed, cement screed (class CT-C16-F4, acc. to EN 13813) manual or machine application, suitable for all-purpose applications. Solido E 160 can be used as floating or bonded screed, as a layer under concrete pavement blocks, pavement, flooring tiles, etc., and as a lining screed, outdoors, on terraces and balconies. . It consists of Portland cement and limestone crushed stone. Solido E 160 covers the requirements of the European standard EN 13813 and the Austrian standard ÖNORM B 3732. Solido E 160 is packed in bags with unit mass 25 kg

BAUMIT SOLIDO E 225

BAUMIT Solido E 225 is a factory-made, ready-mixed, self-levelling cement screed (class CT-C20-F5, acc. to EN 13813) for manual or machine application, suitable for all-purpose applications. Solido E 225 can be used as floating or bonded screed, suitable for floor heating, without additives. This product can be used as a layer under concrete pavement blocks, flooring tiles, including as a lining screed outdoors on terraces and balconies. It consists of Portland cement, limestone crushed stone and an additive. Solido E 225 covers the requirements of the European standard EN 13813 and the Austrian standard ÖNORM B 3732. Solido E 225 is packed in bags with unit mass 40 kg.

Figure 1 and Figure 2 show pictures of packed Solido E 160 and Solido E 225.

Figure 1: Packed Solido E 160 cement screed dry mix

Figure 2: Packed Solido E 225 cement screed dry mix

Table 1 lists the essential characteristics of Solido E 160 and Solido E 225 as per the Product technical specifications.

Table 1: Technical characteristics of Solido E 160 and Solido E 225

Characteristics	Value/Class		Units	Technical specification
	Solido E 160	Solido E 225		
Dry density	≈ 1850	≈ 1850	kg/m^3	BDS EN 13813
Maximum grain size	4.0	4.0	mm	BDS EN 13813
Compressive strength class	C 16	C 20	class	BDS EN 13813
Bending tensile strength class	F 4	F 5	class	BDS EN 13813
Strength class	CT–C16–F4	CA–C20–F6	class	BDS EN 13813
Thermal conductivity, λ_n	≈ 1.0	≈ 1.4	W/(m.K)	
Consumption rate	≈ 2.0	≈ 2.0	kg/m^2 for 1 mm thickness	
Water demand	≈ 2.1-2.5	≈ 3.5-4 .0	litres per bag 25 kg (Solido E 160) litres per bag 40 kg (Solido E 225)	

3. LCA Information

FUNCTIONAL UNIT	1 ton cement screed
SYSTEM BOUNDARIES	Cradle to Gate + options: Modules A1-A3, C1-C4 and Module D
DECLARED DURABILITY	50 years for indoor applications under normal conditions of use
CUT-OFF CRITERIA	As per EN 15804, in the case that there is not enough information, the process energy and materials representing less than 1% of the energy and mass used per module can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded is less than 5% of the whole mass and energy used, as well of the emissions to environment occurred. Flows related to human activities such as employee transport are excluded. In accordance with EN 15804 the construction of plants, production of machines and transportation systems are excluded. Environmental burden of the administrative building is partly considered. Collected data covers all components used for the manufacturing of the cement screed mixes, electricity consumption and fuels use. The total sum of omitted processes is close to 0% of the whole mass of inputs and outputs.
ASSUMPTIONS AND LIMITATIONS	Generic data from ecoinvent v.3.6 database is used to model the components of cement screeds that are delivered by external suppliers and the manufacturer does not have influence on their production processes. Packaging materials and packaging waste are considered in the assessment of all components of Solido E 160 and Solido E 225.
GEOGRAPHICAL COVERAGE AND TIME PERIOD	All data related to the cement screeds is collected from BAUMIT Bulgaria EOOD and represents the manufacturing process in 2018. Assessment of transport of all components covers all used transport types, external and internal transport activities.
DATA QUALITY	The information on the production process of the screeds is collected from BAUMIT Bulgaria EOOD. Information on the transport and composition of components is provided by BAUMIT Bulgaria EOOD. Information on the production process of additives is accounted as presented in ecoinvent v.3.6 database.
ALLOCATION	The factory of BAUMIT Bulgaria EOOD in Elin Pelin produces various construction products for external and internal finishing layers of buildings. The manufacturing processes for both cement screeds are equivalent with slight variance in terms of working regime of drying and mixing stations. Even though, allocation is done regarding energy and fuel use, and generated waste. Environmental impacts, resource use and waste generation are calculated based on yearly data about the inputs/outputs and the yearly production of cement screeds for 2018.

4. Manufacturing process

The received fraction of crushed stone is 20/60 mm and it is dried in an oven, if necessary. This fraction is then crushed in a coarse crusher and subsequently sieved into seven smaller fractions. The smaller fractions are fed into pipelines and then carried to silos.

The other ingredients – Portland cement CEM I 52.5 N and an additive, are delivered as dry substances. Portland cement is delivered by dry bulk cement transportation truck and is discharged into the factory silo (in the factory tower) through pneumatic compressed air pipe system. The additive is delivered in plastic containers and is also discharged into the factory silo.

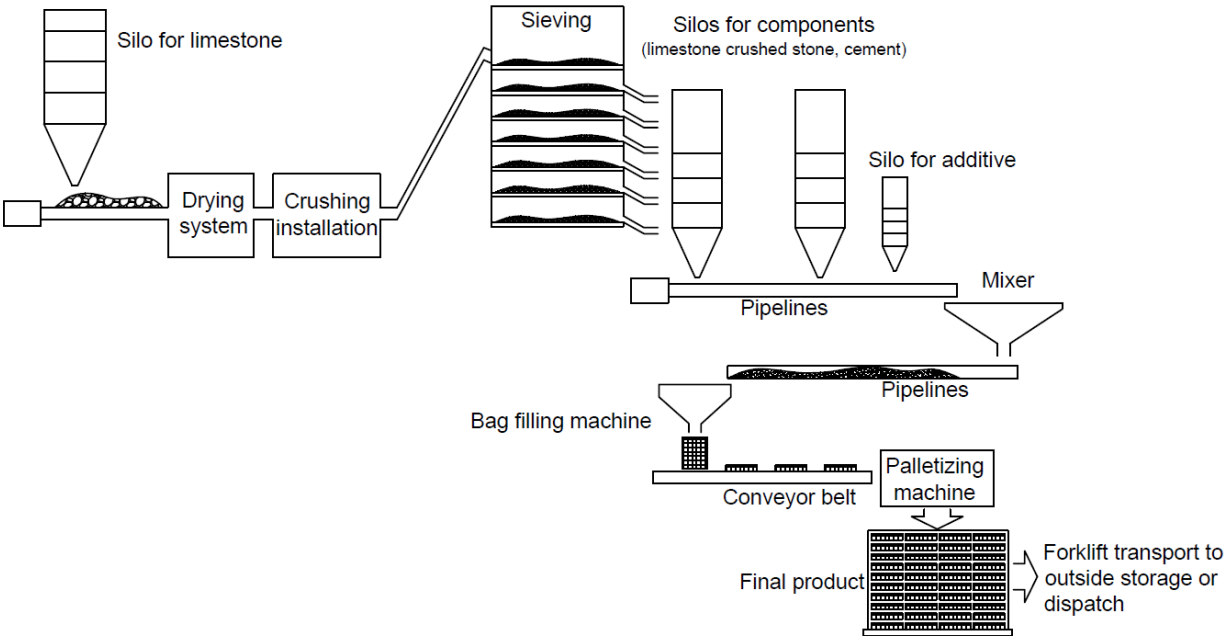

Figure 3: Production process of Solido E 160 and Solido E 225

After the predefined quantity of each material is set, the materials are dosed and released on gravity pipelines that take them to a mixing facility. The ready mix is then transported to a machine for bag-filling. All products are packed in paper bags with mass 40 kg or 25 kg. The sealed bags are transported to the palletizing station through conveying belt. The bags are arranged on the pallets and covered by elastic polyethylene film. The pallets are transported by forklifts to an outside storage space.

5. System boundaries

Module A1: Raw materials supply and transport

The production processes of the Portland cement and limestone crushed stone, and the additive in Solido E 225, are considered using referent data for the ecoinvent database. Production of packaging materials is also considered using referent data from the ecoinvent database.

Module A2: Transport of raw materials to the production site

The transport to the factory of the Portland cement, limestone crushed stone, additive and packaging materials is considered using real data from the manufacturer.

Module A3: Manufacturing
This module considers the actual production process: This includes the process of crushing, drying, sieving, dosing, packaging and palletizing. Energy, water and fuel consumption are considered in full based on 1-year consumption data provided by the manufacturer.

Module C1: Deconstruction/Demolition of the building
Module C1 describes the processing of removal of cement screeds in the context of pavement/flooring replacement. Data is assembled based on the developed scenario.

BAUMIT Bulgaria manufactures and offers construction products since 1995, i.e. for 25 years, but the requirements for selective demolition and separate collection of C&DW are applicable only for 9 years and no concrete data for the end of life of the considered products – cement screed mortars, is available, because the service life of pavements/flooring, where the screeds have been used, is considered to be longer (ca. 10 to 15 years).

The following scenario is developed, based on existing practices in Bulgaria in regards with the construction and demolition waste (C&DW) management and the requirements of the national legislation (WMA, 2012 and Ordinance on C&DW management, 2012 and 2017) for selective demolition and a material recovery degree for some C&DW, such as waste from concrete (at least 85%).

The deconstruction of the cement screeds is considered as a part of the entire pavement/flooring. There are no specific demolition methods, applied in Bulgaria. General purposes electric hand held Jack Hammer concrete breaker is used. The C&DW from the screeds demolition forms waste code 17 01 01 (concrete) or 17 01 07 (mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06), as per the European Waste Catalogue (EWC) and is transported to a treatment facility for recovery operations.

Module C2: Transport to waste treatment facility
Module C2 refers to the transport of the C&D waste containing cement screeds to a facility for waste recovery or disposal. Data is assembled based on developed scenario.

The transport of waste containing cement screeds as part of C&DW of code 17 01 01 is transported to a recovery facility (recycling plant). The transport of waste containing cement screeds as part of C&DW of code 17 01 07 is transported to a site for preliminary treatment and recovery in a backfilling. The following assumptions are made to calculate the impacts of this module:

Table 2: Information on assumed transport for module C2

Parameter	Data
Waste code	17 01 01 or 17 01 07
Bulk density of waste	1600 kg/m^3
Treatment type	Recovery operations R05, R10 or R12
Collection of waste by	Loader with bucket capacity 3,6 m3, tipping load 13.7 tons, operating weight 18.4 tons, Euro IV emissions class, rated power 165 кW / 224HP.
Transport of waste by	Lorry of the size class 7.5-16 tons, Euro IV emissions class.
Distance of transportation	25 km

Module C3: Waste processing
Module C3 accounts for the environmental impacts during the processing of C&DW containing cement screed waste at the waste recovery facility. Data is assembled based on developed scenarios.

The cement screed-containing waste for recovery operations is classified as 'non-hazardous waste' of code 17 01 01 when mixed with debris from concrete blocks or concrete tiles pavement. This C&DW is recycled for all-in fraction 0/63 mm acc. to BDS EN 13242:2002+A1:2007. The recycling process includes crushing and screening. No preliminary treatment, additional sieving to fractions or post-treatment (washing, air cyclone) is applied. In Bulgaria, the recycling is usually performed in a treatment plant, but the main recycling equipment is mobile. The cement screed-containing waste for recovery operations is classified as 'non-hazardous waste' of code 17 01 07 when mixed with debris from ceramic tiles flooring.

When the cement screed is used as underneath/leaning layer of thickness of 35 to 50 mm in flooring with ceramic tiles (thickness of 8 to 20 mm), the screed waste varies from 11% το 82% of waste code 17 01 07, subject to preliminary treatment and recovery in a backfilling. As a preliminary treatment, only a rough crushing is applied to achieve a suitable grain size.

Table 3: Information on assumed processes for module C3

Parameter	**Data**	
Waste code	17 01 01	17 01 07
Treatment type	Recycling into fraction 0/63 mm	Recovery in backfilling
Factory transport of waste and recovered material	Loader with bucket capacity 3,6 m^3, tipping load 13.7 tons, operating weight 18.4 tons, Euro IV emissions class, rated power 165 κW / 224HP.	
Waste crushing and screening	Mobile impact crushing equipment: Feed opening 1,320 x 900 mm; Engine 310 kW / 415 HP and Weight 43 300 kg	
Distance of in-plant transportation	500 m	

Module C4: Disposal
Module C4 should consider the effects from cement screed containing C&DW that is disposed. In the developed scenario no disposal operations are considered.

Module D: Benefits and loads beyond the system boundary
Module D regards the effects and impact of the secondary material derived from recycling of cement screed containing C&D waste.

The recycled crushed stone fraction 0/63 mm of concrete C&DW code 17 01 01, containing cement screed contributes to the saving of natural materials and to the decrease of landfilling. When the treated C&DW of code 17 01 07 containing cement screeds is used as backfilling material, it contributes to the savings of natural raw materials.

However, there is a high variety and thus, high uncertainty, regarding the development of scenarios for Module D. For example, the generation of screed waste is spread all over the territory, but recovery operations differ a lot in different municipalities, the market of recycled materials is not well developed either, the positive impacts associated to the recovery of cement screeds waste are neglected and the impacts related to module D are marked as zero.

6. LCA Results

Declared unit

The declaration refers to 1 ton of cement screed dry mix.

Table 4: Description of the system boundary

Environmental assessment information (☒ – Included in LCA, MNA – Module not assessed)															
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction – assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
☒	☒	☒	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	☒	☒	☒	☒	☒

The following tables provide the LCA results on the evaluated environmental categories. A list of the used abbreviations is given below:

GWP-total	Global warming potential total (sum of GWP-fossil, GWP-biogenic and GWP-luluc)
GWP-fossil	Global warming potential fossil fuels
GWP-biogenic	Global warming potential biogenic
GWP-luluc	Global warming potential land use and land use change
ODP	Ozone depletion potential
AP	Acidification potential
EP-freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine	Eutrophication potential, fraction of nutrients reaching marine end compartment
EP-terrestrial	Eutrophication potential, Accumulated Exceedance
POCP	Photochemical ozone creation potential
ADP-minerals & metals	Abiotic depletion potential for non-fossil resources
ADP-fossil fuels	Abiotic depletion potential of fossil resources
RPER	Renewable primary energy resources
NRPER	Non-renewable primary energy resources
ETP-fw	Eco-toxilcity freshwater (Potential Comparative Toxic Unit for ecosystems)
HTP-c	Human toxicity, cancer effects (Potential Comparative Toxic Unit for humans)
HTP-nc	Human toxicity, non-cancer effects (Potential Comparative Toxic Unit for humans)
IRP	Ionizing radiation, human health (Potential Human exposure efficiency relative to U-235)
SQP	Land use related impacts/ Soil quality (Potential soil quality index)
PM	Particulate Matter emissions (Potential incidence of disease due to PM emissions)

Table 5: Environmental information about 1 ton Solido E 160 cement screed dry mix

Environmental impacts for 1 ton Solido E 160									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	kg CO_2–eq.	8.87E+01	6.66E+00	2.78E+01	1.13E+00	7.81E+00	2.79E+00	0.00E+00	0.00E+00
GWP-fossil	kg CO_2–eq.	8.77E+01	6.66E+00	2.78E+01	1.13E+00	7.81E+00	2.78E+00	0.00E+00	0.00E+00
GWP-biogenic	kg CO_2–eq.	1.08E+00	0.00E+00	2.10E-02	8.10E-04	0.00E+00	1.77E-03	0.00E+00	0.00E+00
GWP-luluc	kg CO_2–eq.	3.10E-03	5.19E-05	2.13E-05	1.11E-06	5.73E-05	8.08E-06	0.00E+00	0.00E+00
ODP	kg CFC 11–eq.	3.42E-06	1.56E-06	1.32E-06	5.42E-08	1.72E-06	5.56E-07	0.00E+00	0.00E+00
AP	mol H^+–eq.	2.26E-01	1.56E-02	1.97E-01	8.17E-03	1.69E-02	5.90E-03	0.00E+00	0.00E+00
EP-freshwater	kg PO_4–eq.	1.05E-02	4.80E-04	6.25E-02	2.54E-03	5.50E-04	3.90E-04	0.00E+00	0.00E+00
EP-marine	kg N–eq.	5.94E-02	2.21E-03	2.90E-02	1.19E-03	2.31E-03	8.50E-04	0.00E+00	0.00E+00
EP-terrestrial	mol N–eq.	6.93E-01	2.36E-02	1.74E-01	7.19E-03	2.45E-02	8.70E-03	0.00E+00	0.00E+00
POCP	kg NMVOC-eq.	1.72E-01	1.27E-02	5.14E-02	2.13E-03	1.23E-02	4.06E-03	0.00E+00	0.00E+00
ADP-minerals&metals	kg Sb–eq.	3.90E-04	1.30E-04	7.59E-05	6.79E-06	2.00E-04	4.82E-06	0.00E+00	0.00E+00
ADP-fossil	MJ	4.66E+02	1.02E+02	4.36E+02	1.77E+01	1.12E+02	3.81E+01	0.00E+00	0.00E+00
WDP	m^3	1.63E+03	8.35E+01	6.11E+03	2.46E+02	1.03E+02	1.00E+02	0.00E+00	0.00E+00

Additional environmental impacts for 1 ton Solido E 160									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
ETP-fw	CTUe	6.06E+00	4.13E+00	1.43E+00	1.25E-01	2.47E+00	2.21E-01	0.00E+00	0.00E+00
HTP-c	CTUh	1.36E-08	1.93E-09	8.56E-09	4.37E-10	3.47E-09	1.74E-09	0.00E+00	0.00E+00
HTP-nc	CTUh	1.06E-06	1.26E-07	1.64E-06	7.32E-08	1.29E-07	3.53E-08	0.00E+00	0.00E+00
IRP	kBq U-235-eq.	3.77E+00	5.26E-01	1.36E+01	5.47E-01	5.78E-01	3.20E-01	0.00E+00	0.00E+00
SQP	-	5.51E+02	1.63E+02	2.80E+01	1.26E+00	6.94E+01	4.64E+00	0.00E+00	0.00E+00
PM	Disease incidence	1.78E-06	5.43E-07	3.15E-07	1.42E-08	4.25E-07	1.23E-07	0.00E+00	0.00E+00

Resource use for 1 ton Solido E 160									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
RPER excluding RPER used as raw materials	MJ	2.27E+01	1.33E+00	3.35E+01	0.00E+00	1.54E+00	1.24E+00	0.00E+00	0.00E+00
RPER used as raw materials	MJ	3.19E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	5.47E+01	1.33E+00	3.35E+01	1.82E+00	1.54E+00	1.24E+00	0.00E+00	0.00E+00
NRPER excluding NRPER used as raw materials	MJ	5.19E+02	1.03E+02	6.72E+02	0.00E+00	1.15E+02	4.12E+01	0.00E+00	0.00E+00
NRPER used as raw materials	MJ	0.00E+00	1.00E+00	2.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	5.19E+02	1.04E+02	6.74E+02	2.73E+01	1.15E+02	4.12E+01	0.00E+00	0.00E+00
Use of secondary material	kg	3.28E+00	3.70E-02	4.69E-02	2.26E-03	5.59E-02	2.17E-02	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	1.69E+00	4.69E-02	1.36E+00	5.51E-02	5.36E-02	9.49E-02	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	1.12E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m^3	2.66E-01	7.37E-03	1.93E-01	7.97E-03	7.75E-03	6.09E-03	0.00E+00	0.00E+00

Output flows and waste categories for 1 ton Solido E 160									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.51E+00	1.01E-01	3.57E-01	1.62E-02	1.31E-01	5.89E-02	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	4.93E+01	1.02E+01	0.00E+00	1.23E+01	5.62E+00	1.85E+00	0.00E+00	0.00E+00
Radioactive waste disposed	kg	2.04E-03	7.10E-04	3.37E-03	1.40E-04	7.80E-04	2.80E-04	0.00E+00	0.00E+00
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.71E+00	3.17E-02	1.84E+01	1.26E-03	4.83E-02	1.97E-02	0.00E+00	0.00E+00
Materials for energy recovery	kg	2.24E-02	5.20E-04	1.34E-02	5.40E-04	6.00E-04	9.40E-04	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Biogenic carbon content	Unit	
Biogenic carbon content in product	kg C	0.00E+00
Biogenic carbon content in accompanying packaging	kg C	3.04E+00

Table 6: Environmental information about 1 ton Solido E 225 cement screed dry mix

Environmental impacts for 1 ton Solido E 225									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
GWP-total	kg CO_2–eq.	1.19E+02	6.93E+00	2.30E+01	1.13E+00	7.81E+00	2.79E+00	0.00E+00	0.00E+00
GWP-fossil	kg CO_2–eq.	1.17E+02	6.93E+00	2.29E+01	1.13E+00	7.81E+00	2.78E+00	0.00E+00	0.00E+00
GWP-biogenic	kg CO_2–eq.	1.51E+00	0.00E+00	1.73E-02	8.10E-04	0.00E+00	1.77E-03	0.00E+00	0.00E+00
GWP-luluc	kg CO_2–eq.	2.64E-03	5.42E-05	1.76E-05	1.11E-06	5.73E-05	8.08E-06	0.00E+00	0.00E+00
ODP	kg CFC 11–eq.	4.33E-06	1.62E-06	1.09E-06	5.42E-08	1.72E-06	5.56E-07	0.00E+00	0.00E+00
AP	mol H^+–eq.	2.95E-01	1.62E-02	1.62E-01	8.17E-03	1.69E-02	5.90E-03	0.00E+00	0.00E+00
EP-freshwater	kg PO_4–eq.	1.36E-02	5.00E-04	5.16E-02	2.54E-03	5.50E-04	3.90E-04	0.00E+00	0.00E+00
EP-marine	kg N–eq.	7.63E-02	2.29E-03	2.40E-02	1.19E-03	2.31E-03	8.50E-04	0.00E+00	0.00E+00
EP-terrestrial	mol N–eq.	8.84E-01	2.44E-02	1.43E-01	7.19E-03	2.45E-02	8.70E-03	0.00E+00	0.00E+00
POCP	kg NMVOC-eq.	2.24E-01	1.31E-02	4.24E-02	2.13E-03	1.23E-02	4.06E-03	0.00E+00	0.00E+00
ADP-minerals&metals	kg Sb–eq.	5.20E-04	1.40E-04	6.26E-05	6.79E-06	2.00E-04	4.82E-06	0.00E+00	0.00E+00
ADP-fossil	MJ	6.16E+02	1.06E+02	3.59E+02	1.77E+01	1.12E+02	3.81E+01	0.00E+00	0.00E+00
WDP	m^3	2.15E+03	8.78E+01	5.04E+03	2.46E+02	1.03E+02	1.00E+02	0.00E+00	0.00E+00

Additional environmental impacts for 1 ton Solido E 225									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
ETP-fw	CTUe	6.47E+00	4.23E+00	1.18E+00	1.25E-01	2.47E+00	2.21E-01	0.00E+00	0.00E+00
HTP-c	CTUh	1.77E-08	2.01E-09	7.06E-09	4.37E-10	3.47E-09	1.74E-09	0.00E+00	0.00E+00
HTP-nc	CTUh	1.40E-06	1.31E-07	1.35E-06	7.32E-08	1.29E-07	3.53E-08	0.00E+00	0.00E+00
IRP	kBq U-235-eq.	4.94E+00	5.47E-01	1.12E+01	5.47E-01	5.78E-01	3.20E-01	0.00E+00	0.00E+00
SQP	-	5.39E+02	1.64E+02	2.31E+01	1.26E+00	6.94E+01	4.64E+00	0.00E+00	0.00E+00
PM	Disease incidence	2.07E-06	5.57E-07	2.59E-07	1.42E-08	4.25E-07	1.23E-07	0.00E+00	0.00E+00

Resource use for 1 ton Solido E 225									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
RPER excluding RPER used as raw materials	MJ	3.10E+01	1.39E+00	2.76E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPER used as raw materials	MJ	2.64E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	5.74E+01	1.39E+00	2.76E+01	1.82E+00	1.54E+00	1.24E+00	0.00E+00	0.00E+00
NRPER excluding NRPER used as raw materials	MJ	6.42E+02	1.08E+02	5.56E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRPER used as raw materials	MJ	4.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	6.87E+02	1.08E+02	5.56E+02	1.15E+02	4.12E+01	0.00E+00	0.00E+00	0.00E+00
Use of secondary material	kg	2.78E+00	3.87E-02	3.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ	2.22E+00	4.91E-02	1.12E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	1.76E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m^3	3.44E-01	7.65E-03	1.59E-01	7.97E-03	7.75E-03	6.09E-03	0.00E+00	0.00E+00

Output flows and waste categories for 1 ton Solido E 225									
Indicator	Unit	A1	A2	A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.98E+00	1.05E-01	2.95E-01	1.62E-02	1.31E-01	5.89E-02	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	6.50E+01	1.03E+01	0.00E+00	1.23E+01	5.62E+00	1.85E+00	0.00E+00	0.00E+00
Radioactive waste disposed	kg	2.63E-03	7.40E-04	2.78E-03	1.40E-04	7.80E-04	2.80E-04	0.00E+00	0.00E+00
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.28E+00	3.31E-02	1.84E+01	1.26E-03	4.83E-02	1.97E-02	0.00E+00	0.00E+00
Materials for energy recovery	kg	2.73E-02	5.40E-04	1.11E-02	5.40E-04	6.00E-04	9.40E-04	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Biogenic carbon content	Unit	
Biogenic carbon content in product	kg C	0.00E+00
Biogenic carbon content in accompanying packaging	kg C	2.60E+01

7. Interpretation

Figure 4 illustrates the shares of product stage modules A1, A2, A3 and end-of-life stage (modules C1-C4) in some environmental impacts of Solido E 160 and Solido E 225. It can be concluded that the primary share on most indicators is formed by the acquisition of raw materials and pre-products (module A1). Their transport to manufacturer's site (module A2) is of much smaller significance and has more distinctive impacts on ODP, ADPE, ADPF and PENRT indicators. The production process (module A3) and related use of machines powered by electricity and fuels also forms relatively big contributions on many indicators.

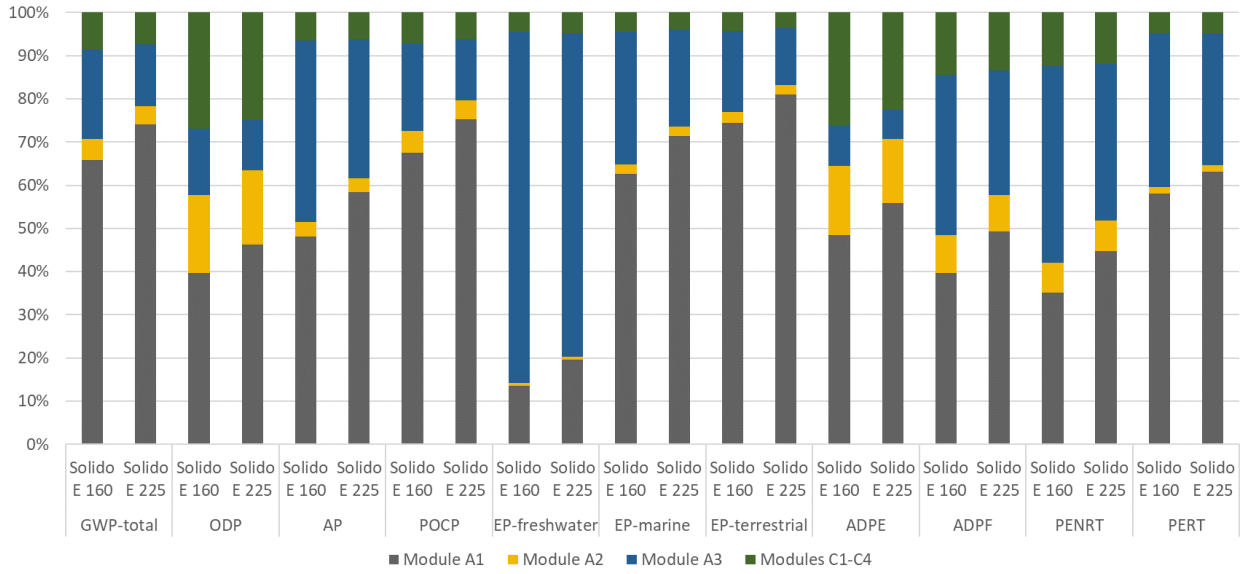

Figure 4: Shares of product stage modules A1, A2, A3 and end-of-life stage (modules C1-C4) in some environmental impacts of Solido E 160 and Solido E 225

The environmental impacts for the end of life stage (modules C1-C4) arise from the operation of machines necessary for the processing of screed waste. These operations include collecting and loading of waste, transport to treatment facility, etc. Since the impacts from machines operation arise mainly from the use of fuels, the indicators of importance are the ozone depletion potential (ODP), abiotic depletion potentials for mineral and fossil resources (ADPE and ADPF), the use of non-renewable resources (PENRT) and the carbon footprint (GWP-total).

8. EPD verification

The process of verification of an EPD is in accordance with ISO 14025, clause 8.1.3 and ISO 21930, clause 9. After verification, this EPD is valid for a 5 years period. EPD does not have to be recalculated after 5 years if the underlying data has not changed significantly.

CEN standard EN 15804 serves as the core PCR along with ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3) ☒ external ☐ internal
Verification of EPD: PhD Eng. Halina Prejzner, PhD Eng. Justyna Tomaszewska LCI audit and input data verification: PhD Eng. Roumiana Zaharieva, PhD Eng. Yana Kancheva, PhD Eng. Justyna Tomaszewska LCA auditor: PhD Eng. Roumiana Zaharieva, PhD Eng. Yana Kancheva Verification of procedures and declaration: PhD Eng. Justyna Tomaszewska

Literature

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[18] Bulgarian Waste Management Act, State Gazette No 53 dated 13.07.2012 and further amendments (Закон за управление на отпадъците)
[19] Bulgarian Waters Act, State Gazette No 67 dated 91 dated 27.07.1999, and further amendments (Закон за водите)
[20] Bulgarian Ordinance No.6 for construction and use of landfills and other facilities for waste recovery and disposal, State Gazette No 80 dated 13 Sept 2013г., and further amendments (Наредба № 6 от 27 август 2013 г. за условията и изискванията за изграждане и експлоатация на депа и на други съоръжения и инсталации за оползотворяване и обезвреждане на отпадъци).
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[22] Bulgarian Ordinance for C&D waste management and use of recycled building materials, State Gazette No 98 dated 8 December 2017 (Наредба за управление на строителните отпадъци и за влагане на рециклирани строителни материали, 2017)

Signature Not Verified
Dokument podpisany przez Agnieszka Winkler-Skalna; ITB
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dr inż. Agnieszka Winkler-Skalna

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