cobiax

Whitepaper over duurzaamheid 2020

Inclusief de Cobiax-milieuproductverklaring
(in het Engels, vanaf pagina 8)

SAVE THE CLIMATE: NOW

Hoe Cobiax het klimaat en de hulpbronnen spaart. Niet binnen 20 jaar, **maar nu**.

cobiax
wider scopes

Acht procent van de wereldwijde CO_2-uitstoot wordt veroorzaakt door de cementproductie: 2,8 miljard ton CO_2 per jaar.

Alleen al in Duitsland, Oostenrijk en Zwitserland wordt jaarlijks meer dan 42 miljoen ton cement geproduceerd. Dit is ook dringend noodzakelijk omdat alleen energie-efficiënte nieuwe gebouwen de klimaatdoelstellingen van Europa haalbaar maken.

Staal en beton zijn echter cruciaal voor het klimaat; hun productie gaat gepaard met een hoog energieverbruik en een massale uitstoot van CO2. Een groot deel van het beton wordt gebruikt in de de vloeren.

20% kan worden bespaard:
Nu. Onmiddellijk.
Bij actuele projecten.

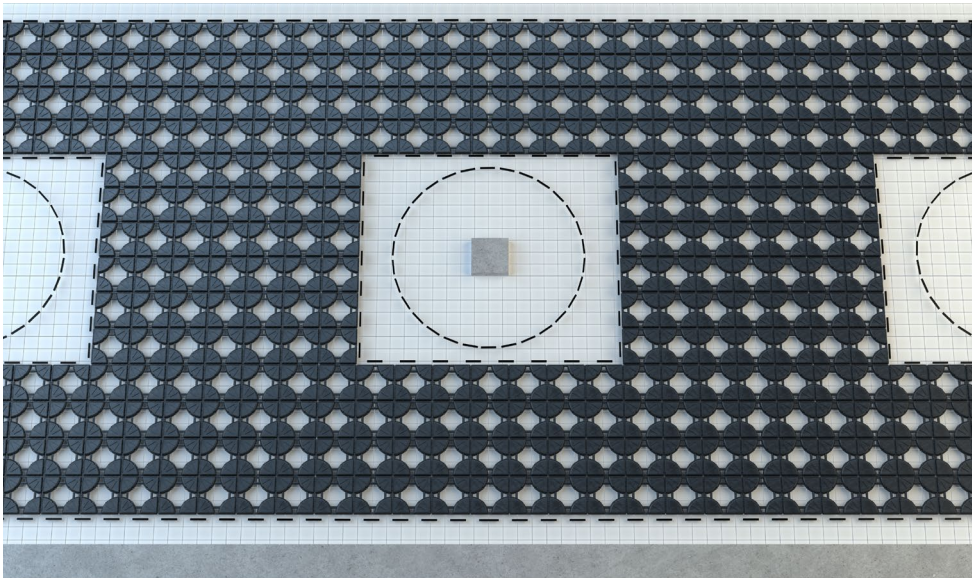
Cobiax holtevormersystemen verminderen het betonverbruik van een vloer tot 35%.

Er zijn veel technologieën op het gebied van ecologisch bouwen die veelbelovende benaderingen bieden voor een duurzame vermindering van het verbruik van hulpbronnen en de CO_2-productie.

De meeste van deze technologieën zijn echter ofwel niet marktrijp, ofwel niet geschikt voor brede toepassingen.

Cobiax-producten zijn klaar voor gebruik, goedgekeurd en duizendmaal bewezen.

En: Ze zijn gemaakt van 100% gerecycleerde kunststof.



Cobiax holtevormers zijn verkrijgbaar voor betonnen vloeren van 20 cm tot meer dan 80 cm. Ca. 50% tot 80% van de vloeroppervlakte wordt bedekt met holle elementen, afhankelijk van de belasting en het stabiliteitssysteem.

Sinds 2000: 180.000 ton CO_2-reductie dankzij Cobiax.

600 t
Beton gespaard

50 t
bespaarde CO_2

2.250 t
Beton gespaard

189 t
bespaarde CO_2

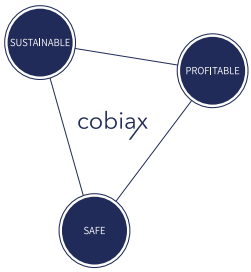
13.000 t
Beton gespaard

1.100 t
bespaarde CO_2

Save the climate: Now

Cobiax is de technologie die **nu** werkt en gecertificeerd is.

Of een bouwproject zich nu in ruw ontwerp of in de planningsfase bevindt, met het Cobiax holtevormersysteem kan het worden gepland of herontworpen op een duurzame manier. Alle toonaangevende bouwkundige ontwerpbureaus hebben de knowhow en de software om met Cobiax snel en eenvoudig te plannen of te herontwerpen.



Verminder nu de CO_2-voetafdruk van uw project!

ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

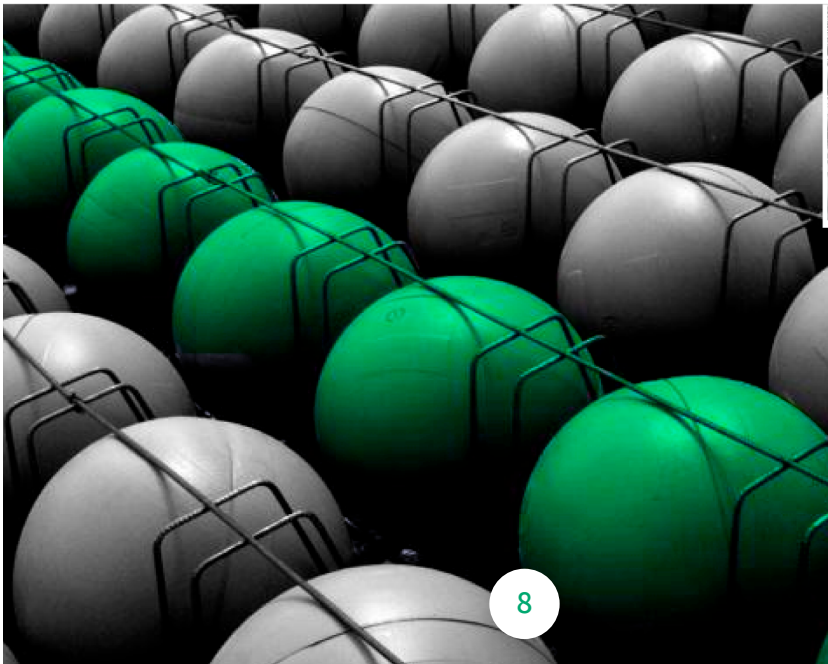
Owner of the Declaration	**Heinze Cobiax Deutschland GmbH**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-COB-20180135-IAD1-EN
Issue date	29.10.2018
Valid to	28.10.2023

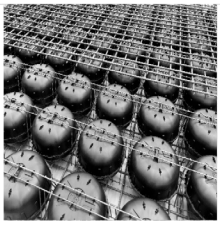
Cobiax void former modules

Heinze Cobiax Deutschland GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com / https://epd-online.com





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1. General Information

Heinze Cobiax Deutschland GmbH	Cobiax void former modules
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Heinze Cobiax Deutschland GmbH Otto-von-Guericke-Ring 10 65205 Wiesbaden
Declaration number EPD-COB-20180135-IAD1-EN	**Declared product / declared unit** 1m³ in-situ concrete slabs featuring Cobiax void former modules from the Slim-Line / Slim-Line-Click and Eco-Line ranges.
This declaration is based on the product category rules: Concrete components made of in-situ or ready-mixed concrete, 07.2014 (PCR checked and approved by the SVR)	**Scope:** This document applies for in-situ concrete slabs featuring "COBIAX" void former modules. The LCA data is based on long-term project data provided by Heinze Cobiax Deutschland GmbH. The data is provided by the production sites in Herford and Remptendorf operated by the plastics manufacturers of the Heinze Group. The void former modules are manufactured at these locations and loaded for transport to the installation site where they are then assembled. The Declaration applies for all COBIAX locations and sales partners supplied within a radius of 400 km of the production sites.
Issue date 29.10.2018	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.
Valid to 28.10.2023	**Verification** The standard /EN 15804/ serves as the core PCR Independent verification of the declaration and data according to /ISO 14025:2010/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	Matthias Schulz (Independent verifier appointed by SVR)
Dipl. Ing. Hans Peters (Head of Board IBU)	

2. Product

2.1 Product description / Product definition

The declared products comprise in-situ slabs of various component heights with void former modules made of grid-shaped reinforcing steel support cages and integrated spherical void formers made of 100% recycled plastic.
The void former modules are marketed as Eco-Line (spheres) and Slim-Line (half-shells). Slim-Line is used for slab thicknesses of 20-46 cm and Eco-Line for 40-75 cm.

The product is not subject to any EU legal harmonising specifications and does not, therefore, bear a CE mark. Use of the product is subject to the respective national specifications at the place of use; in Germany, for example, the state building codes and the technical specifications based on these guidelines.

2.2 Application

COBIAX modules are used for manufacturing reinforcing steel slabs from normal concrete in order to deflect vertical and horizontal loads in multi-storey buildings.
The void former modules are used with the aim of reducing the dead-load of the structure as well as reducing the materials used, thereby enabling more material-efficient supporting structures.

2.3 Technical Data

As the void formers are arranged in the statically ineffective area of the slabs, the mechanical material features of COBIAX slabs largely correspond with the features of a solid reinforced concrete slab. The applicable design standards for reinforced concrete elements must be taken into consideration. The COBIAX Technology Manual also provides the appropriate design aids. The parameters indicated in

the following tables exclusively refer to solid reinforced concrete slabs.
The void formers can improve the insulating features of the slabs. Owing to the thermal bridge effect of the surrounding concrete, a "worst-case scenario" should however be assumed and the physical characteristics of a solid reinforced concrete slab applied.
The strength and building physics parameters refer to normal concrete types C20/25 to C45/55 and reinforcing steel BSt 500.
*In accordance with the P322/06 statement by ITA Ingenieurgesellschaft für technische Akustik mbH on sound protection offered by Cobiax void flat plate slabs, the air and impact sound protection of Cobiax slabs can be classified as being close to solid slabs within the meaning of Tables 11,12 & 16, Supplement 1 of the DIN 4109 standard.

Construction data

Name	Value	Unit
Thermal conductivity conductivity to DIN EN 12524	2.3	W/(mK)
Water vapour diffusion resistance factor to DIN EN 12524	80/130	-
Sound absorption coefficient *	irrelevant	%
Gross density	2400	kg/m³
Compressive strength (cylindrical compressive strength of concrete to DIN 1045)	20 - 45	N/mm²
Tensile strength (nominal yield strength of reinforcement to DIN 1045)	500	N/mm²
Flexural strength (concrete to DIN 1045)	23 - 40	N/mm²
Modulus of elasticity (concrete to DIN 1045)	28800 - 35700	N/mm²
Equilibrium moisture content to DIN 4108-4	0.13	%

Product performance values in terms of its characteristics following the relevant technical determination

2.4 Delivery status

Void former modules made of reinforcing steel and hollow cores are supplied in the form of cages of 2.5 metres in length, 11.5 to 34.5 cm (Slim-Line) and 19.0 to 46.2 cm (Eco-Line) high, up to 50 cm wide and weighing up to 13.3 kg.
In-situ concrete and reinforcement modules are delivered separately.
The void former modules can also be fitted with concrete semi-precast elements. The semi-precast slabs, void former modules, in-situ concrete, and additional reinforcements are delivered separately.

2.5 Base materials / Ancillary materials

Depending on the slab depth, 1m³ COBIAX void flat plate slabs contains the following material volumes when fitted with 65% void formers and a reinforcement angle of 1.8%:

Concrete	93.4% by mass
Reinforcing steel to DIN 488-1	6.1% by mass
Void former (PEHD or PP)	0.5% by mass

The product / At least one partial product contains substances on the List of Candidates (15.01.2018) exceeding 0.1% by mass: No.

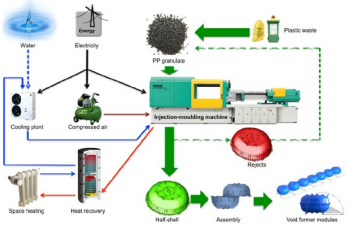
The product / At least one partial product contains other CMR substances in category 1A or 1B which are not on the List of Candidates, exceeding 0.1% by mass in at least one partial product: No.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products (No. 528/2012): No.

2.6 Manufacture

Slim-Line void former modules are manufactured in an injection-moulding process largely in the Herford plant. As a base material, plastic recyclate in granulated form is fed into the injection-moulding machine and converted into a thermoplastic material with energy supplied in the form of electricity. Compressed air is used to form semi-precast elements (half-shells) which can be assembled without any additional energy supply to form void formers before being fitted inside the reinforcement elements.

The following graphic depicts the schematic production process at the Herford plant.



Eco-Line void former modules are manufactured in a blow-moulding process at the Remptendorf plant. As at the Herford plant, plastic recyclate in granulated form undergoes thermoplastic conversion and blow-moulding to form finished void formers, dispensing with the intermediate step of half-shell assembly.

2.7 Environment and health during manufacturing

COBIAX void formers are manufactured in accordance with the national specifications governing industrial and environmental protection.

2.8 Product processing/Installation

COBIAX flat slabs can be designed as a "purely in-situ concrete solution" with conventional formwork or in combination with semi-precast elements (element slabs):

In-situ concrete solution:
COBIAX void former modules are unloaded from the truck using a construction site crane. After installation of the lower flexural reinforcement layer, the modules are laid using the COBIAX mounting aid and fixed in place. This is followed by installation of the upper reinforcement layer. Apart from concrete displacement,

the void former modules also serve as spacers for the upper reinforcement layer. COBIAX void former modules are approx. 2.50 metres long and are shortened in accordance with the dimensions indicated on the installation plan. The specified spherical grid must always be observed during assembly.

The concrete must be applied and consolidated in the specified quality grade. For void formers of 10 to 31.5 cm in height, d = 16 mm should be selected as the maximum grain size. Concrete displacement gives rise to a buoyant force during the concrete pouring process. Avoid buoyancy on the part of the void formers by applying suitable measures to hold the individual void former modules down. This is achieved by concreting in 2 layers. When pouring the first concrete layer, ensure that the lower longitudinal rods of the cage modules are enclosed in accordance with the installation plan. After stiffening (also dependent on the concrete composition, weather etc.), this layer secures the COBIAX void former modules downwards. The correct height of the void former modules must be checked after the first concreting step.
If holes are drilled through the top of the concreted COBIAX void flat plate slabs, e.g. for suspending walls, they must be sealed again afterwards. This aims to prevent individual void formers filling with water.
If the areas without void formers are also enclosed in the first layer of concrete, a composite joint must be established and a bond reinforcement included if necessary.

Semi-precast variant:
Installation of the semi-precast elements is followed by transverse and joint reinforcement. Then the COBIAX installation aid is used to position the COBIAX void former modules between the cage modules on the semi-precast element. This is followed by application of the upper reinforcement layer.
The concrete must be applied and consolidated in the specified quality grade. For void formers of 10 to 31.5 cm in height, d = 16 mm should be selected as the maximum grain size. Concrete displacement gives rise to a buoyant force during the concrete pouring process. Avoid buoyancy on the part of the void formers by applying suitable measures to hold the individual void former modules down. This is achieved by spot-connecting the upper reinforcement layer with the upper belt of the cage modules. The S-hooks required for this are included in the scope of supply by Heinze Cobiax Deutschland GmbH. Please refer to the installation plan for the requisite spacings.

2.9 Packaging
The finished COBIAX void former modules are packed in bundles without packaging materials for delivery to the construction site.
On delivery of the semi-precast elements (half-shells) for Slim-Line void formers, recyclable LLDPE foil is incurred.

2.10 Condition of use
No particular features need to be taken into consideration during the period of use.

2.11 Environment and health during use
No inter-reactions by hazardous substances of health or environmental relevance can be anticipated.

2.12 Reference service life
The reference service life for reinforced concrete hollow slabs with a concrete composition in accordance with the limit values outlined in DIN EN 206 is at least ≥ 50 years under the respective exposure class / environmental conditions.

Influences on ageing when the recognised rules of technology are applied.

2.13 Extraordinary effects

Fire
A COBIAX void flat plate slab is regarded as a solid reinforced concrete slab in terms of technical fire safety.
Product fire safety is regulated by the respective approval.

Fire protection

Name	Value
Building material class for reinforced concrete	A
Building material class for void formers	min. B2
Fire-resistance class or component as a whole	F30-A - F180-A

Based on the test certificate and the technical fire safety risk assessment by MFPA Leipzig

Where the concrete covering is applied correctly, no toxic gases or vapours can arise in the event of a fire.

Water
No contents which are hazardous to water are used.

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Mechanical destruction
Contents released in the event of unforeseen mechanical destruction do not represent any environmentally-harmful risk.

2.14 Re-use phase
De-constructed slab systems featuring void formers are crushed and sifted conventionally. Results by Darmstadt Technical University (1999) indicated that less than 0.2 mass percentage of non-mineral residue remains in the recycling material which can be reused as an aggregate material. The void former fragments sorted during processing can be reused or recovered energetically following the appropriate treatment as recyclate.

2.15 Disposal
After the appropriate treatment, the processed void former waste can be redirected to the material circuit as plastic recyclate (HD polyethylene) or recovered as energy (waste code 17 02 03 as per the European Waste Catalogue).
After processing (crushing and sifting), the concrete can be reused as an aggregate material (waste code 17 01 01 as per the European Waste Catalogue).

2.16 Further information
Information on the recyclability of in-situ concrete slabs with plastic void formers is based on test report no. 233.1.99 conducted by Darmstadt Technical University dated 09.08.1999.

More information is available on the COBIAX web site: www.cobiax.com.

3. LCA: Calculation rules

3.1 Declared Unit
This Declaration refers to the production of 1m³ "Cobiax" void flat plate slabs comprising 65% void formers and a degree of reinforcement accounting for 1.8 per cent by volume. The Life Cycle Assessment was conducted for both types of void former (Slim-Line and Eco-Line) and various slab depths of 20 to 60 cm. The LCA results of the less ecologically favourable slab depth of 20 cm and Slim-Line 100 void formers are applied for the Declaration. As a "worst-case scenario", the EPD is therefore also representative for slab depths of 20 to 60 cm.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Density (mass per m³)	2167	kg/m^3
Percentage of reinforcement	1,8	% by volume
Conversion factor to 1 kg	0.000461	-
Percentage of void formers	65	%

The declared unit is converted to 1 kg taking consideration of the actual mass of the reinforced concrete slabs featuring void former modules. Owing to concrete displacement, the mass is lower than for conventional reinforced concrete slabs with a density of 2400 kg/m³.

3.2 System boundary
Type of EPD: cradle to plant gate with options
The following modules and processes were taken into consideration:

Production stage A1 to A3:
- Concrete production process including provision of raw materials and transport to the production site
- Steel production process including provision of raw materials and transport to the production site
- Production of plastic recyclate (allocated as per ISO 14040)
- German power mix for re-granulation of plastic production waste (approx. 60% of the processes plastic) and for production of the void formers including generation and distribution
- Transporting the plastic re-granulate from the manufacturing site to the Cobiax module production site
- Transporting the reinforcement cages from the manufacturing site to the Cobiax module production site

Transport to construction site A4:
- Transporting the concrete by truck to the construction site
- Transporting the reinforcing steel by truck to the construction site
- Transporting the void formers by truck to the construction site

3.3 Estimates and assumptions
COBIAX void flat plate slabs comprise patented COBIAX void former modules and normal concrete with concrete steel reinforcement manufactured in a conventional process. Both the in-situ concrete and reinforcements are provided by regional suppliers. The LCA data on concrete and reinforcement manufacturing is estimated using the "1.4.01 Concrete C20/25" and "4.1.02 Reinforcement steel" data sets in the Ökobau.dat data base.

On the basis of information supplied by the manufacturer, 110 km were estimated for transporting the plastic re-granulate to the production site for manufacturing the void formers.
An average distance of 30 km for concrete and reinforcement steel and 400 km for the plastic components and reinforcement cages were estimated for the transport processes from the plant gate to the construction site.

The LCA results published in this EPD represent a COBIAX slab system with a slab depth of 20 cm which represents the least ecological version of COBIAX slabs. Some higher slab systems have up to 7% less impact on the environment. The detailed results can be requested directly from COBIAX.

3.4 Cut-off criteria
All base materials and energy flows for manufacturing COBIAX void flat plate slabs as well as the transport processes from plant gate to plant gate and plant gate to construction site were taken into consideration in the Life Cycle Assessment. Owing to its insignificance, the

packaging foil for transporting Slim-Line half-shells has been ignored.

3.5 Background data

The volumes on which the LCA is based represent empirical values collated by COBIAX over many years. The background data used for the LCA was taken from the Ökobau.dat.

3.6 Data quality

The background data on the manufacturer on which the LCA is based is from 2018. The data sets from the Ökobau.dat are from the following reference years:

- 1.4.01 concrete C20/25: 2016
- 4.1.02 reinforced steel: 2016
- 9.2.05 power mix 2015 (D): 2016
- 9.3.01 truck: 2016

The data sets originate from the Ökobau.dat data base (valid: 2018). The data sets are representative for 2019.
They do not provide any details on secondary fuels in the LCIA.

3.7 Period under review

The LCIA data is based on many years of project and product experience on the part of Heinze COBIAX Deutschland GmbH. The data originates from 2017/2018, the years the Life Cycle Assessment was drawn up.

3.8 Allocation

Allocation concerning plastic manufacturing for the void formers is depicted below. The plastic used is exclusively processed from recycled material and as a secondary material. In accordance with information provided by the manufacturer, the primary substances are substituted in full. The impact by plastic manufacturing on the environment is therefore fully allocated to the upstream production processes in accordance with EN 15804.

Furthermore, the energy required for re-granulation of plastic recyclate material is also allocated. In accordance with information provided by the manufacturer, 60% of plastic recyclate is purchased from the dual system or comprises re-granulated production waste. As re-granulation is necessary for manufacturing the void formers, the requisite energy volume is allocated to the COBIAX slab system boundary.

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.

The background data base used is /Ökobau.dat/ 2017-I (last revised 27.11.2017). The data sets conform with the DIN EN 15804 standard and are calculated on the basis of GaBi background data.

4. LCA: Scenarios and additional technical information

The following technical information forms the basis for the declared modules or can be used for developing specific scenarios within the context of a building analysis:

Transport to construction site (A4)

Name	Value	Unit
Litres of fuel per tonne	2.045	l/100km
Transport distance for concrete and reinforced steel	30	km
Transport distance for void former modules	400	km
Capacity utilisation (including empty runs)	85	%
Total permissible truck weight	20 - 26	t

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5. LCA: Results

The results of the estimated impact are relative statements which do not make any claims regarding impact category limits, exceeding threshold values, safety levels or risks.

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	X	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	MND	MND	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ COBIAX void flat plate slabs

Parameter	Unit	A1-A3	A4
Global warming potential	[kg CO_2-Eq.]	298.68	4.53
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.63E-10	8.96E-13
Acidification potential of land and water	[kg SO_2-Eq.]	5.51E-1	1.08E-2
Eutrophication potential	[kg $(PO_4)^3$-Eq.]	7.41E-2	2.53E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	4.78E-2	-3.15E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	3.59E-4	4.84E-7
Abiotic depletion potential for fossil resources	[MJ]	1861.62	61.39

RESULTS OF THE LCA - RESOURCE USE: 1 m³ COBIAX void flat plate slabs

Parameter	Unit	A1-A3	A4
Renewable primary energy as energy carrier	[MJ]	619.65	41.36
Renewable primary energy resources as material utilization	[MJ]	0.00	0.00
Total use of renewable primary energy resources	[MJ]	619.65	41.36
Non-renewable primary energy as energy carrier	[MJ]	2112.36	61.62
Non-renewable primary energy as material utilization	[MJ]	0.00	0.00
Total use of non-renewable primary energy resources	[MJ]	2112.36	61.62
Use of secondary material	[kg]	9.00	0.00
Use of renewable secondary fuels	[MJ]	IND	IND
Use of non-renewable secondary fuels	[MJ]	IND	IND
Use of net fresh water	[m³]	8.52E-1	4.78E-3

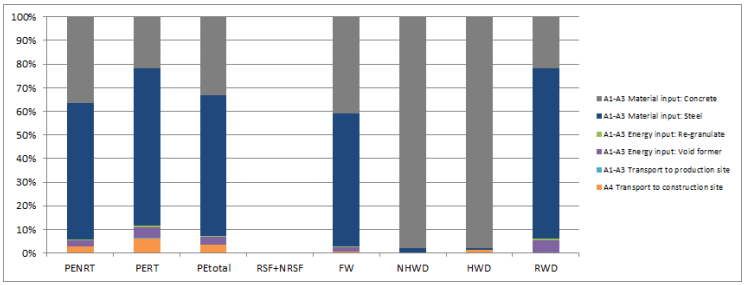
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m³ COBIAX void flat plate slabs

Parameter	Unit	A1-A3	A4
Hazardous waste disposed	[kg]	2.59E-4	3.86E-6
Non-hazardous waste disposed	[kg]	7.46E+1	4.73E-3
Radioactive waste disposed	[kg]	9.93E-2	9.32E-5
Components for re-use	[kg]	0.00	0.00
Materials for recycling	[kg]	0.00	0.00
Materials for energy recovery	[kg]	0.00	0.00
Exported electrical energy	[MJ]	0.00	0.00
Exported thermal energy	[MJ]	0.00	0.00

6. LCA: Interpretation

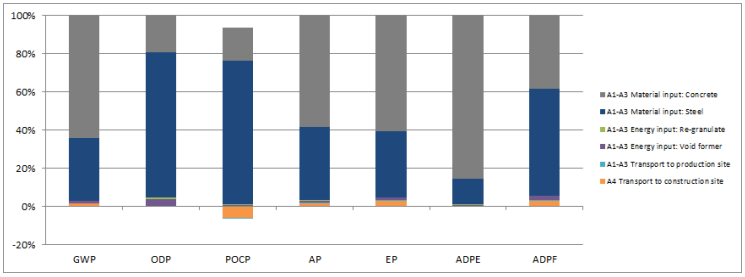
Total primary energy of 2,835 MJ is required for manufacturing and transporting 1m³ COBIAX slabs, whereby primary energy requirements are dominated by the provision of reinforcement steel accounting for 59.7%. The percentage of concrete production accounts for 33.1%, making it and steel production the major influential factors for primary energy requirements as well as for the other indicators in the Life Cycle Inventory Analysis. Energy required for re-granulation of plastic recyclate and production of the void formers is very low at 3.5%. Transport to the place of installation accounts for 3.6% of total primary energy requirements which also represents a very minor influence.

The following graphic depicts the dominating process factors for the indicators in the Life Cycle Inventory Analysis, whereby primary energy requirements (PERT, PENRT, PE total) and use of fresh water (FW) are taken into consideration as well as the waste fractions (NHWD, HWD, RWD).



The impact indicators are also significantly influenced by the production process associated with the base materials concrete and steel (90-97%). In the case of ODP, POCP and ADPF in particular, the steel component is dominant for flexural reinforcement and hollow reinforcement cages.
At 0.1-3%, transport of the base materials to the installation site has only a minimum influence on the impact indicators. Transport only has a significant impact of approx. 7% on impact potential in the case of the Photochemical Ozone Creation Potential (POCP). The electricity required for converting plastic re-granulate and manufacturing the void formers only has a very minor influence on the impact potentials, accounting for less than 2% (5% of ODP).

The following graphic depicts the dominating process factors on the basis of their shares in the impact analysis indicators:



7. Requisite evidence

COBIAX advises planners and building contractors of reinforced steel void flat plate slabs, and supplies construction sites with void former modules. The company does not however manufacture the flexural reinforcement layers or concrete supplied as in-situ concrete by local suppliers. The respective concrete suppliers are responsible for this evidence.

7.1 Radioactivity
Cobiax void flat plate slabs largely comprise concrete and steel (99.5% of mass) and recycled plastic. Concrete displays a low level of natural radioactivity. Structural steel can have a slightly increased level since 1940. It can be assumed, therefore, that Cobiax void flat plate slabs are comparable with standard reinforced concrete slabs.

7.2 Leaching
Cobiax void formers are integrated in concrete and are not directly weathered. Leaching performance is not, therefore, of relevance.

7.3 VOC emissions
No VOC emissions can be anticipated by the primary components (concrete and steel) of void flat plate slabs. The void formers are made from hard recycled plastic and are interlocked. The plastic elements are also integrated in the reinforced concrete and do not come into contact with ambient air with the result that VOC emissions can be regarded as irrelevant.

8. References

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