Environmental Product Declaration

In accordance with ISO 14025:2006, EN 15804:2012+A2:2019/AC:2021 and ISO 21930:2017 for:

CPAC Normal concrete 280 KSC (C24/28, MPa)

from

The Concrete Products and Aggregate Co., Ltd.,

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0017806
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
EPD Owner:	The Concrete Products and Aggregate Co., Ltd.
Address:	1516 Pracharat 1 Road, Khwaeng Wong Sawang, Khet Bang Sue, Bangkok 10800 Thailand
Website:	https://web.cpac.co.th/th/home
Products:	Ready mixed concrete

International EPD® System

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Third-party verification

Name and organization of verifier:	EUROPEAN INSPECTION AND CERTIFICATION COMPANY S.A.
Date and location:	89 Chlois and Likovriseos Str. Metamorfosi 144 52, Athens / Greece
Signature:	Lead Verifier: Ioannis Sotirakis, EUROCERT S.A. 
This declaration is based on the European standard - EN 15804:2012+A2:2019/AC:2021 Independent verification of the declaration and data, according to EN ISO 14025 ☐ Internal ☒ External	
Reference standards:	ISO 14025:2006, ISO 14020:2000, EN 15804:2012+A2:2019/AC:2021, ISO 21930:2017, PCR 2019:14 Construction-products and services, version 1.3.4
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by accredited certification body Third-party verification: EUROCERT S.A. is an approved certification body accountable for the third-party verification. The certification body is accredited by: Hellenic Accreditation System SA (E.S.Y.D), Accreditation number 21	

LCA Information

Title:	Life Cycle Assessment of Ready Mix Concrete of The Concrete Products and Aggregate Co., Ltd: 1 m^3 average concrete
Date of Issue:	Nov 2024
Preparer:	Monwikan Kajohnboon - Environment and Social Manager Banthita Tangsuwan – Environment and Social Assistant Manager Phuchit Sooklon – ESG Consultant Environment & Social Management Department Email: monwikak@scg.com, Banthita@scg.com, phuchits@scg.com The Concrete Products and Aggregate Co., Ltd. 1516 Pracharat 1 Road, Khwaeng Wong Sawang, Khet Bang Sue, Bangkok 10800 Thailand

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.

The report presents the aggregated results per indicator and per life cycle stage, as per PCR 2019:14 Construction products version 1.3.4 (EN 15804: A2) and complementary PCR c-PCR-003 Concrete and concrete element (EN 16757)

This product is classified as identical product which is not marketed as different products and/or is in no other way distinguishable by a downstream customer. For identical products, variations due to differences of GHG emission between the declared result and results from each ready-mixed concrete plant with the highest and the lowest result that are below 10%

Company Profile

The Concrete Products and Aggregate Co., Ltd. (CPAC), subsidiary of the Siam Cement Group (SCG), was established on October 28, 1952. With the latest concrete technology, the largest production capability and the broadcast service networks, we have been the market leader of ready-mixed concrete producer in Thailand. Initially, it was founded cement usage domestically by manufacturing a variety of concrete products under "CPAC" brand from precast to pre-stressed elements to ready-mixed concrete. For over 70 years, we strive to develop new products with state of the art technology, and to continually improve product quality and services in order to meet customers' need and satisfaction.

We strive to raise standard and build strong foundation for Thai construction industry. CPAC is a "pillar" of the industry with our high quality ready-mixed concrete, other concrete-related products and outstanding services. CPAC, for example has invented a small concrete mixer as another alternative in concrete transport to provide concrete work to difficult to access areas. Another example is CPAC Franchise. CPAC Franchise is an expansion of the ready-mixed concrete factory network following the format of a business franchise. CPAC will continue to transfer its experience and technology together with high quality ready-mixed concrete all around the country. Moreover, CPAC also developed CPAC Concrete Payment through Counter Services which gives customers the simplest paying channel at a nearest 24-hour convenience store. Customers are better served in terms of convenience, time-saving and also expense-saving. In addition, CPAC has develop another method in order to enhance relationship closely to customers through CPAC Call Center service via phone no. 02 555 5555, which our well-trained, experienced staffs give answering any questions asked, giving advice about concrete work and selling concrete to retails customers.

While continually developing the organization, we also have a challenging goal of leading both society and environment for sustainable growth. As a company, we take our role as a corporate citizen seriously. Our environmental policies are clear and proactive. We – as an organization and as individual – play an active role in our communities, including providing financial and material support to programs and projects that benefits society, CPAC commit to stand alongside the Thai society and jointly develop the Thai society, sustainably.

Company Information

The production process of CPAC to the standards of product manufacturing with quality control at every step. It ensures quality from the selection of raw materials to the final stage of product manufacturing before distribution, ensuring that the produced products meet the specified standards such as Thailand Industrial Standard (TIS). CPAC products also received Carbon Footprint Product Labels and Carbon Footprint Reduction Labels by Thailand Greenhouse Gas Management Organization.

Each product is manufactured from many factories in the own assets of CPAC. For the ready-mixed concrete, CPAC has a total of 370 ready-mixed production plants located in 6 regions in Thailand, as Figure1 and Table 1 below:

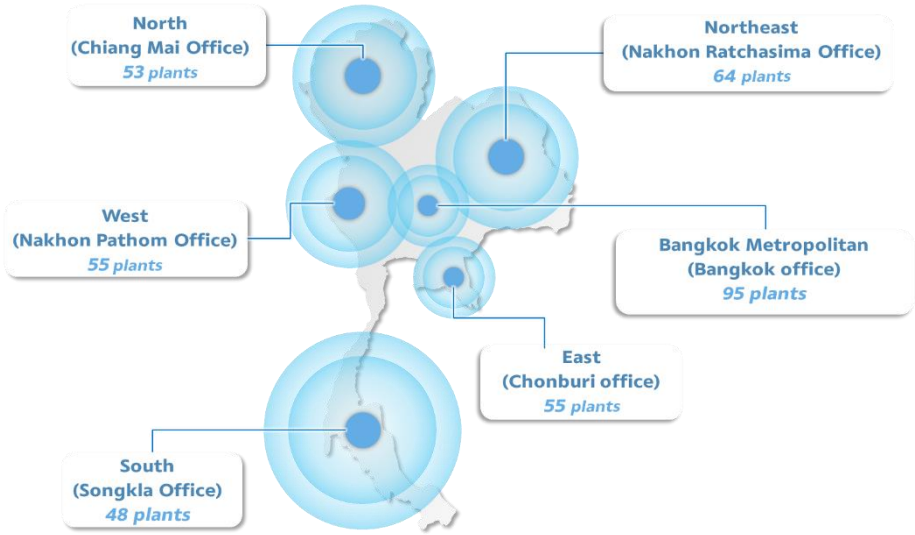

Figure 1 : 370 ready-mixed production plants located in 6 regions in Thailand of CPAC

Table 1: Ready-mixed concrete production address located in Thailand

Located Area	Head office address	No. of ready-mixed plants
Bangkok Metropolitan	1516 Pracharat 1 Road, Khwaeng Wong Sawang, Khet Bang Sue, Bangkok 10800	95
East	90 Moo.10 Chonburi bypass Road, Tambol Ban Suan, Amphur Muang, Chonburi 20000	55
Northeast	1274/1 Mittraphap Road, Tambol Nai Muang, Amphur Muang, Nakhon Ratchasima 30000	64
North	139 Moo.6 Super Highway Road, Tambol Nongpakrang, Amphur Muang, Chiang Mai 50000	53
South	15 Kanchanawanit Road, Tambol Kho Hong, Amphur Hat Yai, Songkhla 90110	48
West	911 Phetkasem Road, Tambol Sanam Chan, Amphur Muang, Nakhon Pathom 73000	55

Company Certifications, awards and standards

The commitment from the past to the present brings the pride of being accepted with the "Standard system" which CPAC, the first and the only one concrete supplier in Thailand that has achieved the certification of all standard systems. With the ESG business vision of CPAC in increasing the proportion of Green Construction through environmentally friendly products such as Green Product and environmentally friendly construction services such as Green Solution, responding to the needs of customers who are environmentally conscious.

Our company focuses on excellence and honor to have received several esteemes awards, certification, and quality standards as follows :

Standards and certifications

Global Cement and Concrete Association (GCCA) Charter

Green Product Labels

Carbon Footprint for Organization
from Thailand Greenhouse Gas Management Organization (Public Organization)

Carbon Footprint for Product
from Thailand Greenhouse Gas Management Organization (Public Organization)

Carbon Footprint Reduction Labels
from Thailand Greenhouse Gas Management Organization (Public Organization)

Investing rater awards

A-level in climate change from Carbon Disclosure Project

Environment, Social and Governance (ESG) Standard,
The Stock Exchange of Thailand

The highest score in the Construction Materials Industry from the DOW Jones Sustainability Indices

Product information

Product Name
CPAC Normal concrete 280 KSC (C24/28, MPa)

Product Description
CPAC normal concrete is typically designed for general construction purposes and is known for its reliability and consistency in quality. It suitable for a wide range of construction projects, from residential buildings to commercial structures and infrastructures. CPAC normal concrete is made from a mix of SCG cement, water, selected chemical admixtures, and aggregates, it has a compressive strength of C240/280 KSC (C24/28, MPa) at 28 days. The specific formulations meet local construction standards and requirements.

Standard

- The United Nations Central Product Classification (UN CPC)

Table 2: The United Nations Central Product Classification (UN CPC) code 375 Articles of concrete, cement and plaster

Group	Class	Subclass	Title	Corresonding		
				HS200	CPC2	ISIC4
375	3751	37510	Non-refractory mortars and concretes	3824.5	37510	2395

- Thailand Industrial Standard (TIS) 213

LCA information

Functional unit / declared unit:

The declaration is established product of these manufacturing plants. The average is based on the accounted production volume of each plant. The declared unit is 1 m^3.

Reference service life:

Cradle-to-grave boundary conditions.

Time representativeness:

The data used in this study cover the reporting year of 2023.

Database(s) and LCA software used:

Database is collected from all Ready-mix concrete plants in Thailand follow methodology - GCCA's Industry EPD Tool for Cement and Concrete (V4.2), International version.

This LCA was modelled with the program EPD Tool v.4.2 from GCCA (Global Cement and Concrete Association) with the scope of A1-D, cradle-to-grave.

Key assumption & Allocations:

Due to the similarity in production processes and manufacturing technologies among 370 ready-mixed plants, data collection for production will be collected from actual data at each facility and weighted average by mass for each product.

The study does not include the followings:

- Capital equipment production
- Equipment maintenance
- Human labor and employee transport

Allocation was minimized wherever feasible. Electricity and water usage can be collected 90% coverage data from all ready-mixed concrete plants. Therefore, representative data were used for the missing data. It was collected from actual usage ratio by its own production, then converted to overall representative data by total production. And allocated this represented data into each product. After that, the completed data were allocated to each specific product and allocated by mass. No by-products are generated during mixing process and they are omitted for the allocation from by-products.

For transportation, the distance was calculated as an average distance (weight average).

GWP-GHG of the electricity mix used is 0.6605 kg CO_2eq./kWh calculated from national database on power generation from different resources in reference with the Annual Report 2022, the Electricity Generating Authority of Thailand (EGAT) and the Annual Report 2022, the Energy Policy and Planning Office (EPPO), the Ministry of Energy, Thailand. This also complies with PCR 1.3.4 section 4.8.1 (Residual electricity mix on the market).

Comparability:

EPD performance for construction products that they do not comply with EN 15804 may not be comparable. EPDs from separate programs but within the same product category may not be comparable as well.

Cut-off rules

The PCR: Section 4.4 and ISO 21930: Section 7.1.8 cut-off criteria were complied with. Every necessary set of input/output data was gathered and incorporated into the LCI modeling. Within the framework of this EPD, no compounds with toxic or hazardous qualities that may harm human health or the environment were found.

Description of underlying LCA – Based information

The ready-mixed concrete of all plants in the following the steps as shown in Figure 2:

1. **Raw Material**

   The production process commences with the raw material supply, encompassing the extraction and processing of raw materials e.g Cement, Rock, Sand, Fly ash and Admixture, and the generation of electricity and water necessary for manufacturing process.

   The primary raw materials utilized in the CPAC ready-mix concrete production process consist of cement, rock, sand and fly ash sourced from SCG cement plants, supplier quarry and power plants respectively.

2. **Mixing Process**

   A usual concrete batching plant consists of a mixer where cement, aggregates, water and admixtures are weighted and mixed together in specific proportions to produce concrete of specific technical characteristics.

   Aggregates of different granulometry (Rock, Sand) are stored in storage areas. A loader fills the aggregates hopers from which the required quantity is retrieved and transferred to the mixer. The moisture of aggregates is periodically checked to adjust the amount of water added to the mixture.

   The cement from SCG cement plants and fly ash are delivered to each concrete batching plant and stored in silos and added to the mixer via screw conveyors while the water and admixtures via discharging systems.
   After the required mixing time, the fresh concrete is loaded to the mixer truck and shall be delivered within 2 hours. Quality control at batching plant is performed in both raw materials and final product. Regarding to the final product, the fresh concrete test and sampling specimens shall be done before dispatching.

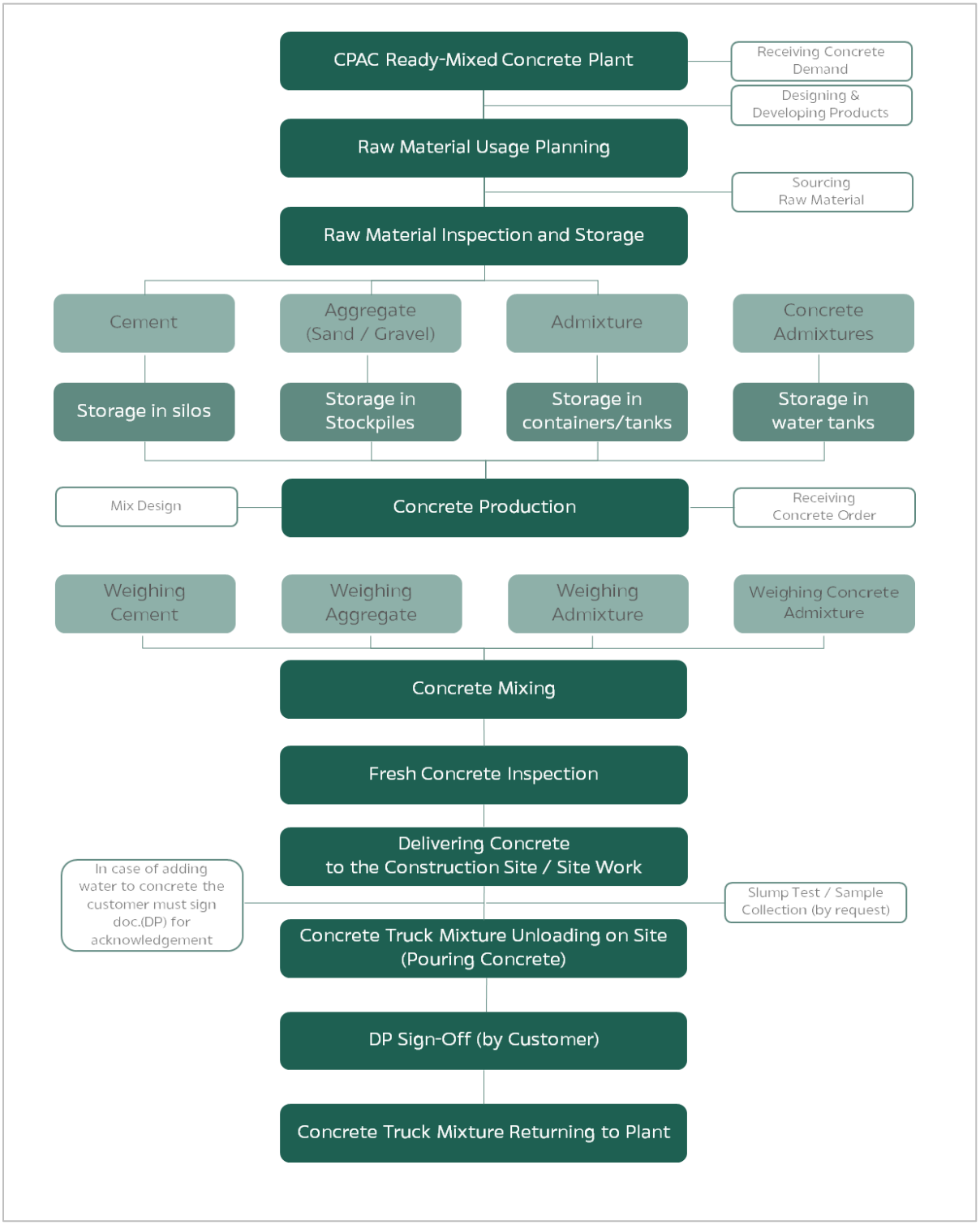

Figure 2: The ready-mixed concrete production process

Modules A1-A3: Product stage

A1: Raw Material Supply
The production process commences with the raw material supply, encompassing the supply of primary raw materials utilized in the CPAC ready-mix concrete production process consist of cement, rock, sand and fly ash sourced from SCG cement plants, supplier quarry and power plants respectively.

A2: Transport
The transportation of primary raw materials to the manufacturer involves sourcing from cement plant and power plant as well as from suppliers to the entrance of CPAC ready-mix concrete plant. Trucks are employed to transport raw materials from various regions to each of CPAC ready-mix concrete plants.

Cement from SCG's cement plants are also transported via trucks. Rock and sand are sourced from CPAC's suppliers is also transported to the CPAC ready-mix concrete plant via trucks.

Additionally, other raw materials such as fly ash, additives and admixtures are transported via trucks and stored at the plants

A3: Manufacturing
A usual concrete batching plant consists of a mixer where cement, aggregates, water and admixtures are weighted and mixed together in specific proportions to produce concrete of specific technical characteristics.

Aggregates of different granulometry (Rock, Sand) are stored in storage areas. A loader fills the aggregates hopers from which the required quantity is retrieved and transferred to the mixer. The moisture of aggregates is periodically checked to adjust the amount of water added to the mixture.

The cement from SCG cement plants and fly ash are delivered to each concrete batching plant and stored in silos and added to the mixer via screw conveyors while the water and admixtures via discharging systems.

After the required mixing time, the fresh concrete is loaded to the mixer truck and delivered within 2 hours. Quality control at batching plant is performed in both raw materials and final product. Regarding to the final product, the fresh concrete test and sampling specimens shall be done before dispatching.

Modules A4-A5: Construction process stage

A4 : Transport
Transport of ready-mix concrete to the construction site by the mixer truck within 2 hours. Parameters referenced by the GCCA EPD tool default conventional transport for concrete constant.

A5 : Construction installation
This is the phase where concrete is placed, shaped, compacted, and finished at the construction site. The product is directly transferred from the truck to the construction site. Parameters referenced by the GCCA EPD tool default construction constant.

Modules B1-B7: Use stage

B1-B7 modules represent the Use Stage of concrete in the life cycle of a building or structure. This stage covers the period from when the building or structure is first utilized until its end of life. These stages address the performance, maintenance, and impacts associated with the use of concrete over its lifetime.

Since carbonation of concrete occurs during the use stage (B1), this process involves the reaction of CO_2 in the air with calcium hydroxide in the cement paste. Therefore, the B1 stage is included in calculations in accordance with EN 16757. However, the remaining other B modules B2 (Maintenance), B3 (Repair), B4 (Replacement), B5 (Refurbishment), B6 (Operational energy use) and B7 (Operational water use) do not affect the calculation for the related products.

B1: Use
This stage covers the basic use of the structure, such as a building, road, or bridge, where the concrete performs its designed function without significant maintenance or intervention.

B1 relates to recarbonation. Recarbonation is a natural process that occurs when concrete interacts with CO_2 in the air. Concrete can potentially reabsorb up to 100% of the CO_2 released during the limestone calcination stage of cement production.

Recarbonation in ready-mixed concrete can have a negative impact, as it can potentially absorb CO_2 in the air due to various factors, including natural CO_2 absorption, resistance class, thickness of the concrete element, and environmental conditions that facilitate absorption.

CPAC referenced the default value of recarbonation from the GCCA EPD tool, which is 2.55 kg CO_2 eq. per cubic meter of ready-mix concrete.

B2: Maintenance
This stage accounts for all routine and preventive maintenance is carried out to preserve the structure's functionality and extend its service life.

B3: Repair
This stage accounts for all repairs that are necessary when the concrete structure suffers damage that affects its performance or appearance.

B4: Replacement
This stage accounts for all of the concrete structure may need to be replaced if it has reached its end of life or has impacted by an irreparable damage.

B5: Refurbishment
This stage accounts for the refurbishment involves modifying or upgrading the structure to improve its performance, appearance, or functionality without fully replacing it.

B6: Operational energy use
This stage accounts for the energy required to operate the building or structure throughout its lifespan.

B7: Operational water use
This stage focuses on the water required for the building's or structure's operation, such as in heating, cooling, and cleaning systems.

Modules C1-C4: End of Life

The C1-C4 stages represent the End-of-Life phase of concrete in a building or structure's life cycle. These stages focus on what happens to the concrete when the structure reaches the end of its functional life.

C1 : De-construction Demolition
This stage covers the dismantling or demolition of the concrete structure once it has reached the end of its service life. GCCA EPD tool default demolition values have been used.

C2 : Transport
This stage refers to the transportation of the demolished concrete from the site to a waste processing facility, recycling plant, or landfill. GCCA EPD tool default transport values have been used.

C3 : Waste processing
This stage involves the processing of demolished concrete to prepare it for reuse, recycling, or final disposal.

Thailand does not have specific waste legislation regarding the disposal of demolition materials; therefore, national data on demolition materials are unavailable. As a result, this product is 0% recycled, and the default waste processing values from the GCCA EPD tool have been used.

C4 : Disposal
This stage involves the final disposal of any concrete waste that cannot be recycled or reused. Waste from this product is 100% utilized as landfill. GCCA EPD tool default disposal values have been used.

Module D: Benefits and Loads

This stage refers to the potential benefits and environmental impacts associated with recycling or reuse from concrete that occur outside of the building or structure's life cycle. The product is 0% recycled. The default benefits and loads values of the GCCA EPD tools have been used.

Table 3: Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

	Product stage		Construction process stage			Use stage							End of life stage				Resource recovery stage
	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-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH	TH
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	N/R			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = Declared module, N/R = Not relevant

This section presents the aggregated results per indicator and per life cycle stage, as per PCR 2019:14 Construction products (EN 15804:A2) and complementary PCR c-PCR-003 Concrete and concrete element (EN 16757), including i) core environmental impact indicators (14 indicators), ii) additional environmental impact indicators (6 indicators), iii) parameters describing resource use (10 indicators), iv) other environmental information describing waste categories (3 indicators), and environmental information describing output flows (5 indicators)

The scope of this study is “cradle to grave” covering the product stage (modules A1-D)

The reference models are in line with the requirements of EN 15804 (EF 3.1).

Product Components

Average Concrete mix designs

Concrete Product Category	Cement (%)	Rock (%)	Sand (%)	Admixtures (%)	Water (%)
CPAC Normal concrete 280 KSC	11% - 13%	38% - 47%	36% - 43%	0.08% - 0.10%	5% - 6%

Environmental Information

This section presents impact categories (indicators 1-14 and 15-20) for each indicator and per life cycle stage, as per PCR 2019:14 VERSION 1.3.4 Construction products (EN 15804: A2) and complementary PCR c-PCR-003 concrete and concrete element (EN 16757)

Impact per 1 m^3 average

Potential environmental impact – mandatory indicators according to EN 15804

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG**	kg CO_2 eq.	2.68E2	1.1E+1	1.66E+1	-2.55E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	8.99E+0	9.24E+0	0E+0	-1.82E+1	0E+0
GWP-tot*	kg CO_2 eq.	2.68E2	1.1E+1	1.66E+1	-2.55E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	8.99E+0	9.24E+0	0E+0	-1.82E+1	0E+0
GWP-fos*	kg CO_2 eq.	2.68E2	1.09E+1	1.65E+1	-2.55E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	8.99E+0	9.23E+0	0E+0	-1.82E+1	0E+0
GWP-bio*	kg CO_2 eq.	1.01E-1	4.29E-3	7.22E-3	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	1.6E-3	6.6E-3	0E+0	8.75E-3	0E+0
GWP-luc	kg CO_2 eq.	4.09E-2	3.7E-3	4.51E-3	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	1.13E-3	5.36E-3	0E+0	7.11E-3	0E+0
ODP	kg CFC 11 eq.	8.94E-6	2.09E-6	1.71E-6	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	1.62E-6	1.55E-6	0E+0	4.32E-6	0E+0
AP	mol H+ eq.	7.84E-1	5.67E-2	1.13E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	9.42E-2	5.57E-2	0E+0	1.27E-1	0E+0
EP-fw	kg P eq.	4.84E-2	8.16E-4	3.26E-3	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	4.02E-4	1.23E-3	0E+0	1.55E-3	0E+0
EP-mar	kg N eq.	3.14E-3	7.1E-5	7.65E-4	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	3.34E-5	9.12E-5	0E+0	1.47E-4	0E+0
EP-ter	mol N eq.	2.89E+0	2.03E-1	4.24E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	4.44E-1	1.96E-1	0E+0	4.55E-1	0E+0
POCP	kg NMVOC eq.	6.89E-1	6.11E-2	1.14E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	1.22E-1	5.74E-2	0E+0	1.33E-1	0E+0
ADPE***	kg Sb eq.	2.05E-4	2.04E-5	1.29E-5	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	2.66E-6	1.63E-5	0E+0	1.44E-5	0E+0
ADPF***	MJ, net calorific value	1.51E+3	1.72E+2	1.81E+2	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	1.3E+2	1.38E+2	0E+0	3.69E+2	0E+0
WDP***	m^3 world eq. deprived	8.12E+1	1.27E+0	8.48E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	7.67E-1	1.19E+0	0E+0	1.78E+1	0E+0
Core environmental impact indicators	• GWP-GHG (Global Warming Potential, GHG) • GWP-tot (Global Warming Potential, total) • GWP-fos (Global Warming Potential, fossil fuels) • GWP-bio (Global Warming Potential, biogenic) • GWP-luc (Global Warming Potential, land use and land use change) • ODP (Depletion potential of the stratospheric ozone layer) • AP (Acidification potential, Accumulated Exceedance) • EP-fw (Eutrophication potential, fraction of nutrients reaching freshwater end compartment) • EP-mar (Eutrophication potential, fraction of nutrients reaching marine end compartment) • EP-ter (Eutrophication potential, Accumulated Exceedance) • POCP (Formation potential of tropospheric ozone) • ADPE (Abiotic depletion potential for non- fossil resources) • ADPF (Abiotic depletion potential for fossil resources potential) • WDP (Water (user) deprivation potential, deprivation-weighted water consumption)															

* The indicated values (gross values) include the greenhouse gas emissions from the incineration of secondary fuels at clinker production. The net GWP-tot (excluding the emissions from the incineration of secondary fuels at clinker production) is 261.3 kg CO_2–eq. The net GWP-fos is 261.2 kg CO_2-eq. The net GWP-bio is 6.507E-2 kg CO_2-eq.
** The indicated values (gross values) include the greenhouse gas emissions from the incineration of secondary fuels at clinker production. The net GWP-GHG (excluding the emissions from the incineration of secondary fuels at clinker production) is 261.3 kg CO_2–eq.
*** The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	8.62E-6	1.01E-6	1.98E-6	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
IRP	kBq U235 eq.	5.71E+0	9.08E-1	8.01E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
ETP	CTUe	3.7E+2	3.64E+1	1.65E+1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
HTPC	CTUh	5.68E-2	7.01E-8	1.7E-3	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
HTPNC	CTUh	9.56E-6	1.96E-6	1.18E-6	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
SQP	dimensionless	1.29E+3	3.06E+2	9.98E+1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
Additional environmental impact indicators	• PM (Potential incidence of disease due to PM emissions) • IRP (Potential Human exposure efficiency relative to U235) • ETP (Potential Comparative Toxic Unit for ecosystems) • HTPC (Potential Comparative Toxic Unit for humans - cancer) • HTPNC (Potential Comparative Toxic Unit for humans - non-cancer) • SQP (Potential soil quality index)															

Parameters describing resource use

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ, net calorific value	7.35E+1	4.99E+0	7.66E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
PERM	MJ, net calorific value	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
PERT	MJ, net calorific value	7.35E+1	4.99E+0	7.66E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
PENRE	MJ, net calorific value	1.51E+3	1.72E+2	1.81E+2	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
PENRM	MJ, net calorific value	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
PENRT	MJ, net calorific value	1.51E+3	1.72E+2	1.81E+2	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
SM	kg	1.66E+1	0E+0	4.97E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
RSF	MJ, net calorific value	5.18E+1	0E+0	1.55E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
NRSF	MJ, net calorific value	6.85E+1	0E+0	2.05E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
NFW	m^3	2.37E+0	3.8E-2	1.8E-1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
Parameters describing resource use	• **PERE** (Use of renewable primary energy excluding renewable primary energy resources used as raw materials) • **PERM** (Use of renewable primary energy resources used as raw materials) • **PERT** (Total use of renewable primary energy resources) • **PENRE** (Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials) • **PENRM** (Use of non-renewable primary energy resources used as raw materials) • **PENRT** (Total use of non-renewable primary energy resources) • **SM** (Use of secondary materials) • **RSF** (Use of renewable secondary fuels) • **NRSF** (Use of non-renewable secondary fuels) • **NFW** (Net use of fresh water)															

Other environmental information describing waste categories

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
NHWD	kg	2.7E+1	0E+0	7.31E+1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	2.41E+3	0E+0
RWD	kg	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
Other environmental information describing waste categories	• **HWD** (Hazardous waste disposed) • **NHWD** (Non-hazardous waste disposed) • **RWD** (Radioactive waste disposed)															

Environmental information describing output flows

Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CRU	kg	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
MFR	kg	2.7E+1	0E+0	7.31E+1	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
MER	kg	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
Exported electrical energy	MJ per energy carrier	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
Exported thermal energy	MJ per energy carrier	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0	0E+0
Environmental information describing output flows	• CRU (Components for re-use) • MFR (Materials for recycling) • MER (Materials for energy recovery) • EE (Exported energy)															

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Other environmental information

CPAC is subsidiary of SCG. SCG announced target to achieve Net Zero Emissions refer to Science Base Target initiative (SBTi) by 2050 and 25% greenhouse gases reduction by 2030 from base year 2020. In 2023, SCG achieved a reduction of 7.16 million tons CO_2eq in greenhouse gases emissions or 12.05% from base year 2020 by enhancing alternative fuels usage such as biomass from agricultural wastes and refuse derived fuel (RDF) for cement productions. In addition, our cement plants attempt to increase a proportion of renewable energy by using solar energy and waste heat recovery.

CPAC is eager to develop low carbon concrete products by partially substituting an Ordinary Portland Cement mixture with a Low Carbon Structural Cement.

CPAC also has an Innovation and Technology Research department that is a spearheaded team to enhance these product designs in several methods. For example; mix design formular adjustment and a Supplementary Cementitious Material or SCMs (E.G. Fly ash) for cement usage replacement in concrete production.

Since CPAC has already been placing Low Carbon Structural Cement and Low Carbon Concrete products, we are simultaneously improving product transportation efficiency through EV mixer truck transition to align with CO_2 reduction from the whole product life cycle.

Differences versus previous versions

This is the first EPD version – No previous versions

References

1. Electricity Generating Authority of Thailand (2022) – Annual power consumption report.
2. Energy Regulatory Commission of Thailand (2022) - Annual report.
3. EPD INTERNATIONAL (AB) (2024) Product Category Rules (PCR) 2019:14 - Construction Products; version 1.3.4
4. European Committee for Standardization (2021) EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products
5. European Committee for Standardization (2022) Complementary Product Category Rules c-PCR-003 - concrete and concrete element (EN 16757). ISO 14040:2006 Environmental management – Life cycle .
6. United Nations (2015) United Nations Central Product Classification (UN CPC); version 2.1
7. Global Cement and Concrete Association (2023) - GCCA Industry EPD Tool for Cement and Concrete
    - User Guide (v4.2, International version, 18 December 2023)
    - LCA Model (v4.2, International version, 18 December 2023)
    - LCA Database (v4.2, 18 December 2023)
    - Verification Report (18 December 2023)
8. International Organization for Standardization (2000) ISO 14020:2000 - Environmental labels and declarations - General principles.
9. International Organization for Standardization (2006) ISO 14025:2006 - Environmental labels and declarations - Type III environmental declarations.
10. International Organization for Standardization (2006) ISO 14044:2006 - Environmental management - Life cycle assessment - Requirements and guidelines.
11. International Organization for Standardization (2017) ISO 21930:2017 - Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
12. Office of Natural Resources and Environmental Policy and Planning (2022) – Annual Power data report.
13. United Nations (2015) United Nations Central Product Classification (UN CPC); version 2.1

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