



KETENANALYSE TRANSPORT HERSTELMORTEL



opgesteld in het kader van de CO₂-Prestatieladder

Datum	Revisie	Opmerking
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28/03/2024	01	Aanpassingen door Stijn Arys, Het Agens milieu en duurzaamheidsadvies.

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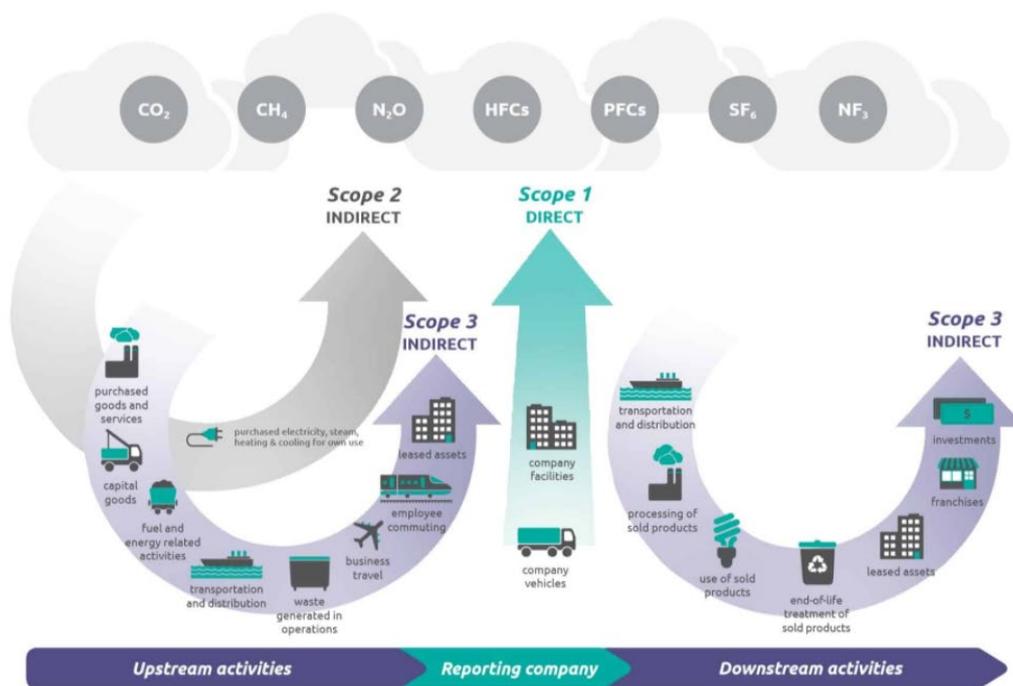
1. Inleiding

1.1. Renotec

De groep Renotec telt 856 medewerkers verdeeld over 6 vestigingen en heeft een omzet van ongeveer 195 miljoen € per jaar. Renotec focust op gespecialiseerde renovatie- en restauratiewerken en geeft gebouwen, monumenten en kunstwerken opnieuw een toekomst. De groep is gespecialiseerd in uitdagende projecten die ambachtelijke kennis vragen. Met stipte aandacht voor veiligheid lost Renotec elk complex en buitengewoon renovatieprobleem op. Renotec houdt vakmanschap onder eigen vleugels. Alle nodige kennis rond de nicheactiviteiten brengt en houdt Renotec zo veel mogelijk in eigen huis. Renotec investeert resoluut in de verdere uitbouw van haar knowhow. Uiteindelijk maken gemotiveerde en betrokken mensen het verschil. Het menselijk kapitaal is de grootste toegevoegde waarde. De baseline van Renotec is niet zomaar ‘Renovating for the future’.

1.2. Ketenanalyses

Vanaf niveau 4 richt de CO₂-prestatieladder zich ook op de invloed die de onderneming heeft in de keten. Buiten de onderneming vinden CO₂-emissies plaats die een duidelijke relatie hebben met de bedrijfsactiviteiten, dit zijn de indirecte emissies (scope III-emissies).



Source: GHG Protocol

FIGUUR 1: SCOPE VAN DE EMISSIE VAN BROEIKASGASSEN (BRON: GHG PROTOCOL)

Scope I is de directe uitstoot door het verbranden van brandstoffen binnen de organisatie zoals bijvoorbeeld het verbranden van aardgas voor ruimte- en procesverwarming of het verbranden van diesel in de voertuigen die eigendom zijn van de organisatie.

Scope II is de indirecte energie gerelateerde uitstoot door de aankoop van elektriciteit en door de aankoop van andere energiestromen zoals stoom, koude, warmte en perslucht.

Scope III is alle overige indirecte uitstoot, zoals de CO₂-uitstoot door transportmiddelen die geen eigendom van de organisatie zijn, bijvoorbeeld de uitstoot van het woon-werk verkeer, het vliegverkeer en het goederentransport dat is uitbesteed. Maar ook de indirecte uitstoot door de aankoop van grondstoffen en verpakkingsmaterialen, uitbestede diensten, het verwerken van afval, het energiegebruik en de behandeling bij einde leven van de op de markt gebrachte producten en de investeringen in machines en gebouwen valt hieronder.

Een ketenanalyse is een analyse van de CO₂-emissies in een van de ketens waarin de onderneming actief is. Een keten wordt gedefinieerd als een bepaalde lijn van aanvoerende en afnemende bedrijven en organisaties.

Op basis van een analyse van alle scope III-emissies waarin een materialiteitsonderzoek uitgevoerd is door middel van een kwalitatieve evaluatie zijn de onderwerpen voor de kwantitatieve ketenanalyse vastgelegd. Materiële emissies hebben een dermate grote omvang dat ze belangrijk zijn voor de afwegingen die de organisatie zelf en belanghebbenden rond de organisatie (zoals bijvoorbeeld de leveranciers) nemen.

Het verstrekken van informatie aan partners binnen de waardeketen is een belangrijk onderdeel van de ketenanalyse. Renotec zal op basis van de ketenanalyse gepaste stappen ondernemen om de partners binnen de keten te betrekken bij het behalen van de reductiedoelstellingen. Door samenwerking kan een groter resultaat worden behaald. Deze ketenanalyse is een eerste aanzet om de reductiemogelijkheden bij het transport van herstelmortels in kaart te brengen.

1.3. Onderwerp van de ketenanalyse

Binnen divisie B is de renovatie en restauratie van beton een belangrijke activiteit naast het versterken van structuren, injectiewerken en de chemische bescherming van structuren. Uit het materialiteitsonderzoek is gebleken dat het transport van herstelmortels een significante bijdrage aan de emissie levert.

Renotec is een belangrijke afnemer in de Benelux voor het gebruik van herstelmortels. De herstelmortel wordt aangevoerd vanuit Italië (lange afstand) en het transport gebeurde in het hier gehanteerde basisjaar van 2022 met vrachtwagens. Voor dergelijke lange afstanden zijn er alternatieven voor het transport van goederen. Op basis van deze inzichten uit de kwalitatieve analyse is er gekozen een ketenanalyse uit te werken voor “het transport van herstelmortels”.

Hoewel de ketenanalyse zich toespitst op herstelmortels, worden de conclusies en opportuniteiten voor reducties waar mogelijk ook doorgetrokken naar andere ketens.

2. Beschrijving van de scope

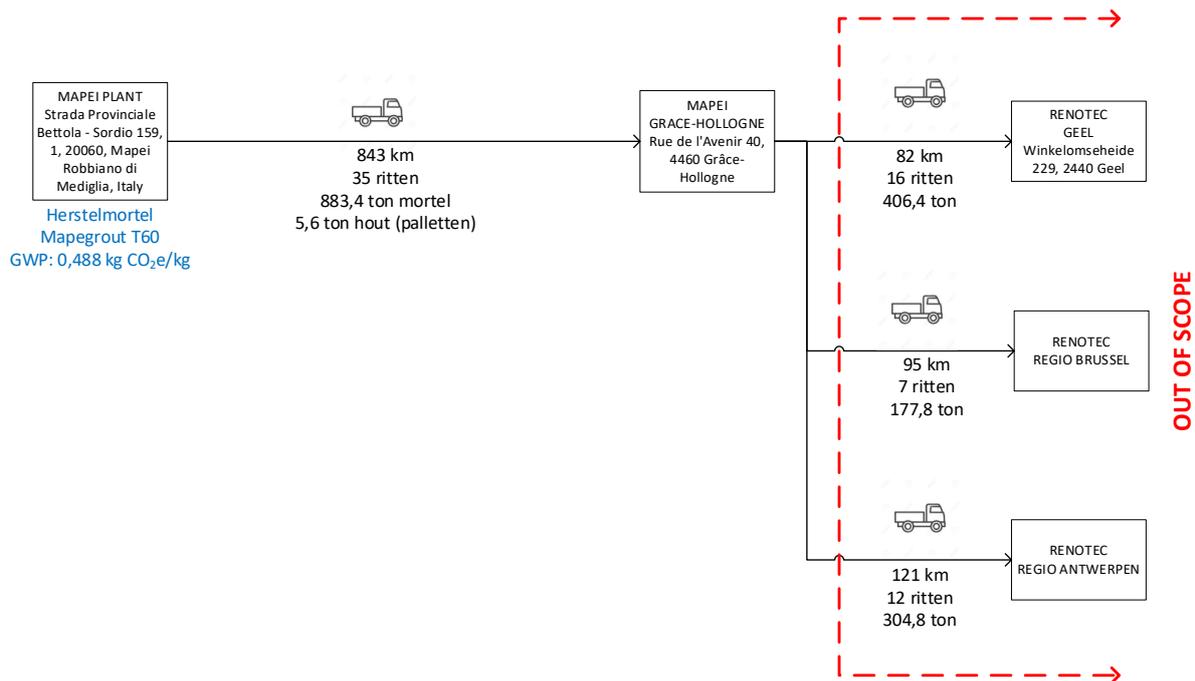
2.1. Scope van de ketenanalyse

Herstelmortels worden aangekocht in zakken van 25 kg. Renotec bestelt standaard herstelmortels bij Mapei. De productie van de herstelmortels gebeurt in de Mapei plant in Mediglia, ten zuidoosten van Milaan. De productie van de herstelmortels zelf wordt niet opgenomen in de scope van de ketenanalyse.



FIGUUR 2: HERSTEMORTEL MAPEGROUT T60

Vanuit de fabriek worden de herstemortels met volle vrachtwagens naar het distributiecenter Mapei Benelux gevestigd in de industriezone van Grâce-Hollogne in de provincie Luik getransporteerd. Vanuit Grâce-Hollogne gebeurt het transport met volle vrachtwagens naar de verschillende afdelingen en/of werven van Renotec. Het onderstaande process flow diagram geeft een schematische voorstelling van de activiteit.



FIGUUR 3: SCOPE VAN DE KETENANALYSE

Daar waar in de eerste versie van de ketenanalyse nadruk gelegd werd op het transport van de leverancier van herstemortels van de vestiging in Italië tot haar verdeelcentrum in België, wordt in de tweede versie ook het natransport in België, en de uitstoot over de gehele keten nader bekeken.

2.2. Ketenpartners

Bij deze ketenanalyse zijn de volgende ketenpartners betrokken.

Activiteit	Naam ketenpartner
Producent herstelmortels	Mapei plant, Mediglia (I)
Vrachtervoer	Frisaye Sodema Ambroggio IT
Distributiecentrum	Mapei Benelux, Grâce-Hollogne

TABEL 1: KETENPARTNERS

3. Resultaat ketenanalyse

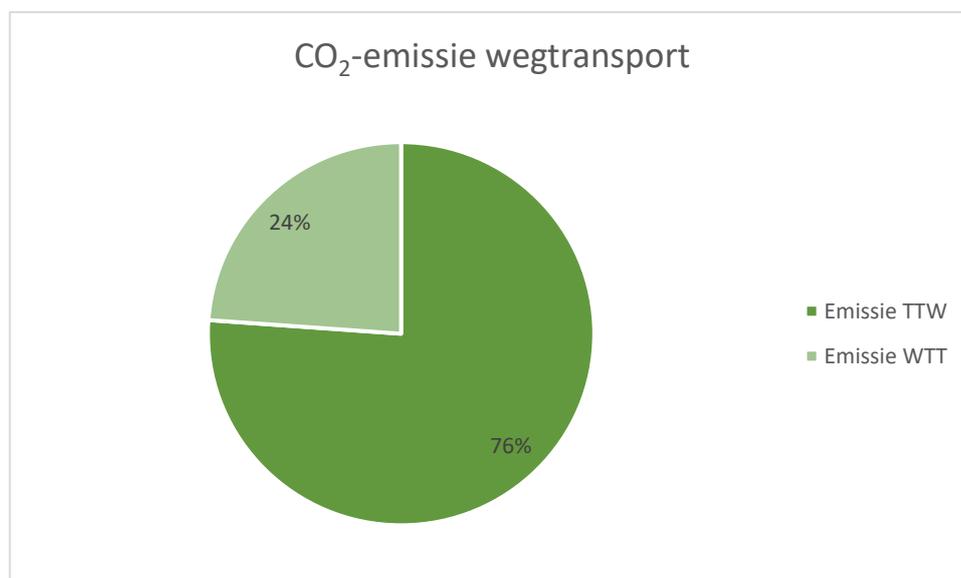
3.1. Berekening CO₂-emissies in het basisjaar 2022

3.1.1. Mdigilia-Grâce - Hollogne (basisjaar 2022)

Voor de berekening van de carbon footprint van het transport van de herstelmortel is uitgegaan van de in 2022 geleverde hoeveelheid (889 ton, inclusief het gewicht van de palletten waarop de zakken gestapeld zijn) en de emissiefactor voor zwaar wegtransport zoals opgegeven in de lijst emissiefactoren op www.co2emissiefactoren.nl. Een overzicht van de gebruikte emissiefactoren is opgenomen in bijlage 1 van deze analyse.

De berekende CO₂-emissie van de activiteit bedraagt 65,95 ton CO₂e in 2022. De emissie is opgebouwd uit 76% tank-to-wheel emissies (TTW) en 24% well-to-tank emissies (WTT).

Betrekken we dit CO₂-tonnage opnieuw op de totale verplaatste hoeveelheid mortel (889 Ton), dan wordt er per kg verplaatste mortel 0,0747 kg CO₂e uitgestoten.



Figuur 4: CO₂-emissie wegtransport

3.1.2. Berekening CO2-emissies natransport

Voor de berekening van de carbon footprint van het natransport van de herstelmortel is uitgegaan van de in 2022 geleverde hoeveelheid (889 ton, inclusief het gewicht van de palletten waarop de zakken gestapeld zijn) en de emissiefactor voor zwaar wegtransport zoals opgegeven in de lijst emissiefactoren op www.co2emissiefactoren.nl; en de volgende data gerelateerd aan het natransport voor heen, en (lege) terugrit.

naar	km	ritten	gewicht vrachtwagen		EF Vrachtwagen			
			tonnage	(ton)	kg CO2e/ton.km	ton.km	Ton CO2e	
Geel	82	16	406,4		20	0,088	59.565	5,24
Brussel	95	7	177,8		20	0,088	30.191	2,66
Antwerpen	121	12	304,8		20	0,088	65.921	5,80
Totaal								13,70

naar	km	ritten	gewicht vrachtwagen		EF Vrachtwagen			
			tonnage	(ton)	kg CO2e/ton.km	ton.km	Ton CO2e	
Geel	82	16	0		20	0,088	26.240	2,31
Brussel	95	7	0		20	0,088	13.300	1,17
Antwerpen	121	12	0		20	0,088	29.040	2,56
Totaal								6,04

Er wordt voor 2022 in totaal 19,73 ton CO2 uitgestoten in het natransport.

Betrekken we dit CO2-tonnage opnieuw op de totale verplaatste hoeveelheid mortel (889 Ton), dan wordt er per kg verplaatste mortel 0,0222 kg CO2e uitgestoten.

3.1.3. Berekening CO2-emissies in de gehele keten

Mapei liet in 2022 een EPD opstellen van hun mortel (zie bijlage 2). Hierin wordt op basis van een LCA studie de uitstoot in de gehele keten berekend, specifiek voor de MAPEGROUT T60 dat ook door Renotec wordt gebruikt.

Op basis van de EPD wordt inzicht verschaft in de uitstoot van de mortel in de verschillende levensfasen van het product. In onderstaande tabel wordt de scope van de EPD getoond.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)																
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	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	ND	X	X

Rijden op HVO100 diesel biedt meerdere voordelen op het gebied van duurzaamheid, zoals een CO₂-reductie en een lagere uitstoot van schadelijke emissies zoals fijnstof, koolwaterstof, stikstofoxiden, koolmonoxide en PAK's. Het is beter voor de lokale luchtkwaliteit en ook goed voor de motor, want filters en injectoren blijven langer schoon.

In België is de brandstof op vandaag in een tiental tankstations verkrijgbaar, dat aantal neemt gestaag toe. Door het transport van herstelmortels te organiseren met vrachtwagens op HVO diesel vermindert de uitstoot van broeikasgassen.

Emissiereductie

Vrachtwagens op HVO100	Waarde	Eenheid
Transportfactor	749.420	tonkilometer
CO ₂ -uitstoot op standaard diesel	65,95	ton CO ₂ e/jaar
CO ₂ -uitstoot op HVO100	6,28	ton CO ₂ e/jaar
Reductie van de uitstoot	59,67	ton CO ₂ e/jaar
Reductie van de uitstoot	90,5	%

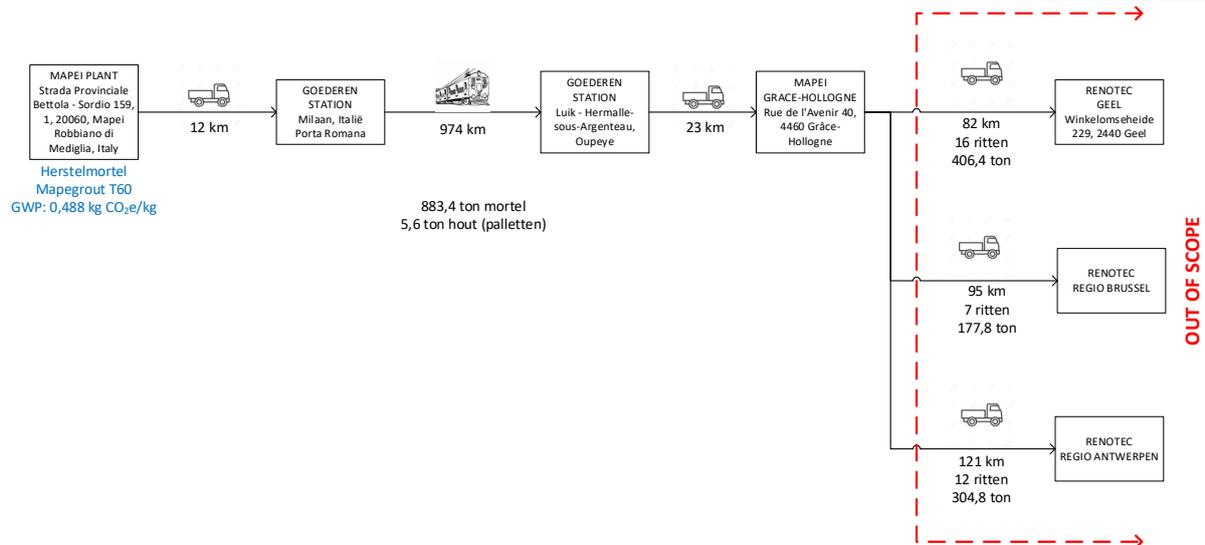
TABEL 3: EMISSIEREDUCTIE DOOR VRACHTWAGENS OP HVO100

4.2. Spoortransport

Er is een hiërarchie in de uitstoot van broeikasgassen door het goederenvervoer. Spoorvervoer en vervoer over het water hebben de laagste uitstoot per kilometer en per vervoerde eenheid, terwijl de luchtvaart en het wegvervoer aanzienlijk meer uitstoten.

Bij het transport van herstelmortels over het spoor is de uitstoot afhankelijk van de vervoerswijze (dieselaandrijving of elektrische aandrijving) en, in geval van een elektrische aandrijving, de carbon footprint van de elektriciteitsproductie van het land waar de trein doorrijdt.

Er moet ook rekening gehouden met de 'first and last mile', dit is het vervoer van de productieplant naar het goederenstation op de plaats van vertrek en van het goederenstation op de plaats van aankomst naar het distributiecentrum. Dit gebeurt met wegtransport.



FIGUUR 5: SPOORTRANSPORT

Emissiereductie

Spoortransport	Waarde	Eenheid
Gewicht	889	ton
Productieplant naar goederenstation (12 km)	0,94	ton CO ₂ e/ jaar
Spoortransport Italië (164 km)	4,24	ton CO ₂ e/ jaar
Spoortransport Zwitserland (247 km)	0,79	ton CO ₂ e/ jaar
Spoortransport Duitsland (509 km)	14,48	ton CO ₂ e/ jaar
Spoortransport Nederland (50 km)	0,53	ton CO ₂ e/ jaar
Spoortransport België (4 km)	0,05	ton CO ₂ e/ jaar
Goederenstation naar distributiecentrum (23 km)	1,80	ton CO ₂ e/ jaar
Totale uitstoot	22,83	ton CO ₂ e/ jaar
Reductie van de uitstoot	43,12	ton CO ₂ e/ jaar
Reductie van de uitstoot	65,4	%

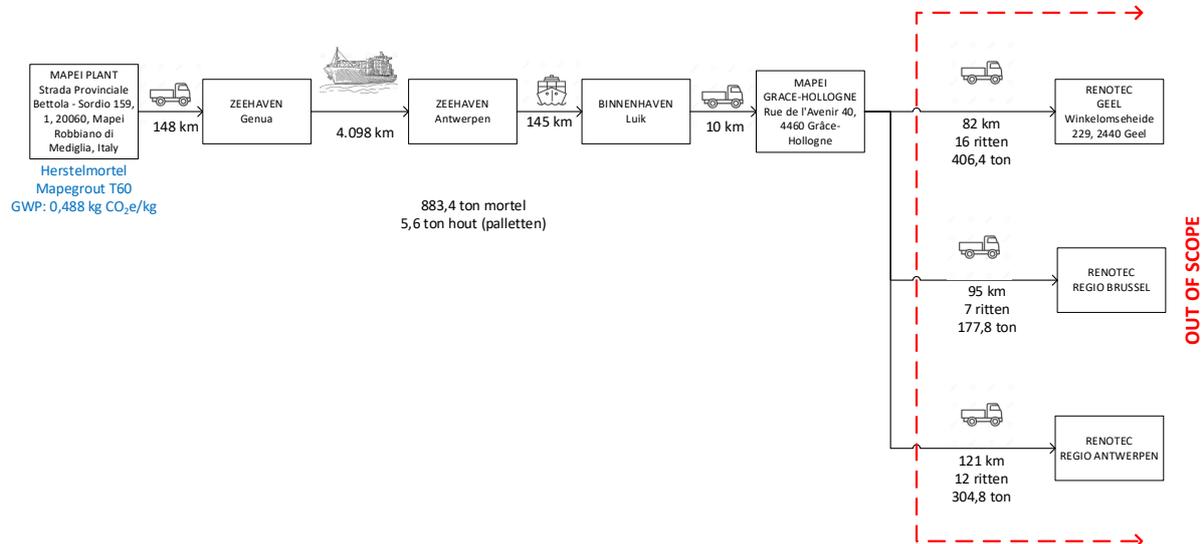
TABEL 4: EMISSIEREDUCTIE DOOR SPOORTRANSPORT

4.3. Watertransport

Het goederenvervoer over het water heeft een lage uitstoot per kilometer in vergelijking met het wegvervoer. Ook bij het vervoer van goederen over het water moet rekening gehouden met de 'first and last mile', dit is het vervoer van de productieplant naar de haven op de plaats van vertrek en van de haven op de plaats van aankomst naar het distributiecentrum.

Het transport over water gebeurt met zeevaart van Genua naar Antwerpen en verder via binnenvaart van Antwerpen naar Luik.

Bij het transport van herstellmortels wordt de af te leggen afstand veel langer bij het vervoer over water aangezien het schip vanuit Italië via de straat van Gibraltar naar België dient te varen. De lange afstand maakt dat het transport over water geen goed alternatief is voor een reductie van de emissie.



FIGUUR 6: WATERTRANSPORT

Emissie

Watertransport	Waarde	Eenheid
Gewicht	889	ton
Productieplant naar Genua (148 km)	11,58	ton CO ₂ e/jaar
Zeevaart van Genua naar Antwerpen (4.098 km)	80,16	ton CO ₂ e/jaar
Binnenvaart van Antwerpen naar Luik (145 km)	3,87	ton CO ₂ e/jaar
Luik naar distributiecentrum (10 km)	0,78	ton CO ₂ e/jaar
Totale uitstoot	96,39	ton CO₂e/jaar
Toename van de uitstoot	30,44	ton CO ₂ e/jaar
Toename van de uitstoot	46,2	%

TABEL 5: EMISSIE DOOR WATERTRANSPORT IN VERGELIJKING MET WEGTRANSPORT

5. Bijkomend punten van zorg en reductiepotentieel

In de tweede versie van deze ketenanalyse worden hieronder een aantal bijkomende punten van zorg en reductie geformuleerd die het bedrijf in overweging kan nemen om initiatieven te nemen om doelstellingen te stellen, hetzij, specifiek in de keten van de aankoop van herstellmortel, hetzij in gelijkaardige ketens.

Het voormalig hoofdstuk <<Evolutie van de reductiedoelstelling>> wordt niet langer opgenomen in de ketenanalyse. Voor formulering van de doelstellingen en hun voorgang wordt verwezen naar de periodieke voortgangsrapporten die in het kader van de CO₂ prestatieladdercertificatie worden opgemaakt.

- Als Renotec het initiatief neemt om samen met een leverancier (bvb Mapei) één of meerdere EPDs op te stellen, dan is dat een sectorbreed initiatief. Indien Renotec bovendien zijn eigen metingen verricht in de keten voor het bekomen van nuttige data, dan levert dit bovendien kwalitatieve primaire data op. Renotec kan bijvoorbeeld ontbrekende data in bestaande EPDs over de constructiefase aanleveren op basis van de eigen data;
- Hoewel het natransport van de herstellmortel op vlak van CO2-reducties schijnbaar minder materieel zijn en de opties voor alternatieve transporten beperkt, zijn er mogelijk wel optimalisaties mogelijk om met vollere transporten te rijden. Met name wanneer er laattijdig mortels worden besteld is het niet altijd mogelijk om het transport optimaal te vullen.
- Er kan samen met de transporteur gezocht worden of er in de nabijheid van de sites in Geel, Antwerpen en Brussel, terugtransporten kunnen worden georganiseerd zodat wordt vermeden dat er leeg leeg wordt gereden.
- De komende jaren trachten veel mortelproducenten stappen vooruit te zetten om meer CO2 arme producten aan te bieden. Renotec, als specialist in het gebruik van herstellmortels, kan nuttige feedback leveren aan een producent als zij nieuw ontwikkelde (low carbon) mortel in een pilootproject zouden testen.

Onderstaande tabel geeft indicatief weer hoe CO2 uitstoot in betontypes sterk afhankelijk is van het type cement. In nauw overleg met de leverancier, kan gezocht worden naar low-carbon alternatieven voor het huidige gebruikte product.

Door in deze tabel de cementtype in de rijhoofden hieronder te vervangen door cementtype in de kolomhoofden hiernaast wordt het aangeduide CO2 reductie per m³ beton bekomen			CEM III / B	CEM III / A	CEM II	CEM I
	Emissiefactor per Kg Cement CE Delft 2020 Tabel 5	Emissiefactor per Kg Beton (13% cement, 2245 kg beton/ m³ of 325 kg Cement/m³)				
			88,400 kg CO2/M³	152,750 kg CO2/M³	208,975 kg CO2/M³	278,850 kg CO2/M³
CEM I	0,858 kg CO2/kg	278,850 kg CO2/M³	-190,450 kg CO2/M³	-126,100 kg CO2/M³	-69,875 kg CO2/M³	0,000 kg CO2/M³
CEM II	0,643 kg CO2/kg	208,975 kg CO2/M³	-120,575 kg CO2/M³	-56,225 kg CO2/M³	0,000 kg CO2/M³	69,875 kg CO2/M³
CEM III / A	0,470 kg CO2/kg	152,750 kg CO2/M³	-64,350 kg CO2/M³	0,000 kg CO2/M³	56,225 kg CO2/M³	126,100 kg CO2/M³
CEM III / B	0,272 kg CO2/kg	88,400 kg CO2/M³	0,000 kg CO2/M³	64,350 kg CO2/M³	120,575 kg CO2/M³	190,450 kg CO2/M³

Door in deze tabel de cementtype in de rijhoofden hieronder te vervangen door cementtype in de kolomhoofden hiernaast wordt het aangeduide CO2 reductie % bekomen			CEM III / B	CEM III / A	CEM II	CEM I
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			88,400 kg CO2/M³	152,750 kg CO2/M³	208,975 kg CO2/M³	278,850 kg CO2/M³
CEM I	0,858 kg CO2/kg	278,850 kg CO2/M³	-68%	-45%	-25%	0%
CEM II	0,643 kg CO2/kg	208,975 kg CO2/M³	-58%	-27%	0%	33%
CEM III / A	0,470 kg CO2/kg	152,750 kg CO2/M³	-42%	0%	37%	83%
CEM III / B	0,272 kg CO2/kg	88,400 kg CO2/M³	0%	73%	136%	215%

- Indien een low carbon alternatief ter beschikking is kan Renotec dit product standaard als low carbon alternatief aanbieden bij projectonderhandelingen. Wanneer er een willingness to pay is kan de klant kiezen voor het low-carbon alternatief.

Bijlage 1: Gebruikte emissiefactoren

Transport	Activiteit	Emissiefactor WTW (kg CO ₂ e/tkm)	Bron
Wegtransport	Zware trekker + oplegger	0,088	www.co2emissiefactoren.nl
Spoortransport	Italië	0,029	Model Bilan Carbone, v8.6.1
Spoortransport	Zwitserland	0,004	Model Bilan Carbone, v8.8
Spoortransport	Duitsland	0,032	Model Bilan Carbone, v8.8
Spoortransport	Nederland	0,012	www.co2emissiefactoren.nl
Spoortransport	België	0,013	www.co2emissiefactoren.be
Watertransport	Zeevaart - kustvaart	0,022	www.co2emissiefactoren.nl
Watertransport	Binnenvaart 1500 - 3000 ton	0,030	www.co2emissiefactoren.nl

tkm: tonkilometer

TABEL 6: EMISSIEFACTOREN

Brandstof	Activiteit	Emissiefactor WTW (kg CO ₂ e/liter)	Bron
Wegtransport	Diesel B7 blend	3,262	www.co2emissiefactoren.nl
Wegtransport	Biodiesel HVO	0,018	www.co2emissiefactoren.nl

TABEL 7: EMISSIEFACTOREN

Bijlage 2: Gebruikte afkortingen

Afkorting	Betekenis
GHG	Greenhouse gas
HVO	Hydrotreated vegetable oil
PAK	Polycyclische aromatische koolwaterstoffen
tkm	tonkilometer
TTW	Tank-to-wheel
WTT	Well-to-tank
WTW	Well-to-wheel

TABEL 8: GEBRUIKTE AFKORTINGEN

Bijlage 3: EPD mapegroup T60 EPD

Mapegrout T60

Model EPD

“Modified mineral mortars, group 1”

(Declaration number EPD-DBC-20220217-IBF1-EN)



DECLARATION OF CONFORMITY FOR PRODUCTS WITH MODEL EPDS

Mapei is a member of FEICA (Association of the European Adhesive & Sealant Industry), which has developed so-called Model Environmental Product Declarations (Model EPDs), independently verified by IBU (Institut Bauen und Umwelt e.V.).

The Model EPDs represent the current production technology in Europe. The compliance of Mapei products to the Model EPDs is checked on the base of their formulations, by using an IBU-approved guideline procedure.

Mapei declares that the product

Mapegrout T60

meets the criteria of the attached Model EPD
“Modified mineral mortars, group 1”
(Declaration number EPD-DBC-20220217-IBF1-EN)

The Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used whenever they are required for the evaluation of the sustainability of buildings where **Mapegrout T60** is applied.

Mapei S.p.A.

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	FEICA, EFCC, IVK, DBC
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-DBC-20220217-IBF1-EN
Issue date	26/09/2022
Valid to	25/09/2027

Modified mineral mortars, group 1

FEICA - Association of the European Adhesive and Sealant Industry

EFCC - European Federation for Construction Chemicals

IVK - Industrieverband Klebstoffe e.V.

DBC - Deutsche Bauchemie e.V.

www.ibu-epd.com | <https://epd-online.com>



ECO PLATFORM

EPD
VERIFIED



1. General Information

DBC - Deutsche Bauchemie e.V.
 EFCC - European Federation for Construction Chemicals
 FEICA - Association of the European Adhesive and Sealant Industry
 IVK - Industrieverband Klebstoffe e.V.

Modified mineral mortars, group 1

Programme holder

IBU – Institut Bauen und Umwelt e.V.
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Owner of the declaration

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Declaration number

EPD-DBC-20220217-IBF1-EN

Declared product / declared unit

1 kg of modified mineral mortar with a density 800 - 1,700 kg/m³

This declaration is based on the product category rules:

Mineral factory-made mortar, 11.2017
 (PCR checked and approved by the SVR)

Scope:

This verified EPD entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies to products produced in Europe and for a period of five years from the date of issue. This EPD may be used by members of FEICA, EFCC, DBC and IVK and their members provided it has been proven that the respective product can be represented by this EPD. For this purpose, a guideline is available at the secretariats of the four associations. The members of the associations are listed on their respective websites.

Issue date

26/09/2022

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.

The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.

Valid to

25/09/2027

Verification

The standard *EN 15804* serves as the core PCR

Independent verification of the declaration and data according to *ISO 14025:2011*

internally externally

Dipl. Ing. Hans Peters
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2. Product

2.1 Product description/Product definition

Modified mineral mortars are combinations of one or more inorganic binders, fillers, aqueous dispersions or dispersion powders, water and if necessary additives. They comply with manifold, often specific, functions in the construction, furnishing and refurbishment of buildings. The product displaying the highest environmental impacts was used as a representative product for calculating the Life Cycle Assessment results (worst-case approach).

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) with the exception of Switzerland) products falling under the Regulation (EU) No 305/2011 (*CPR*) need a Declaration of Performance taking into consideration either the relevant harmonised European standard or the European Technical Assessment and the CE marking. For the application and use of the products the respective national provisions apply.

2.2 Application

Modified mineral mortars are used for the following applications:

Module 1: Modified mineral mortars as repair mortar for the protection and repair of concrete structures

1.1 Products used to restore and/or replace defective concrete

1.2 Products to protect reinforcement, necessary to extend the service life of a concrete structure exhibiting deterioration

Module 2: Adhesives based on modified mineral mortars

2.1 Products for bonding ceramic tiles as well as natural stone for internal and external installations on walls, floors and ceilings

2.2 Products for bonding thermal insulation composite panels

Module 3: Modified mineral mortars as joint fillers

Products for joint filling of wall and floor coverings made of ceramic tiles as well as natural stone for indoor and outdoor applications

Module 4: Modified mineral mortars as screed, floor levelling compounds, fillers, flowing screed

Products for screed/synthetic resin screed for use in floor constructions

Module 5: Modified mineral mortars as levelling compounds for walls and ceilings

Products for levelling and repairing rough, uneven walls, for repairing grit spots, closing blowholes and modelling broken corners and edges

Module 6: Modified mineral mortars as grouts

Products for grouting on holes, recesses, concrete precast columns, foundations and for anchoring machine components indoors and outdoors

Module 7: Modified mineral mortars for liquid applied products for waterproofing of buildings

Products for providing cement-based waterproofing surfaces in structural and civil engineering. For use in new and old buildings as well as beneath tiles

7.1 Liquid-applied water impermeable products for use beneath ceramic tiling

7.2 Products for waterproofing with mineral waterproofing slurries or flexible polymer modified thick coatings

7.3 Products for water proofing in conjunction with ceramic tiles

7.4 Products for waterproofing with flexible polymer modified mineral thick coatings

Module 8: Modified mineral mortars for waterproofing floors and/or walls inside buildings

Products for watertight covering in wet rooms inside buildings

2.3 Technical Data

The density of the products is between 0,80 and 1,70 g/cm³, other relevant technical data can be found in the manufacturer's technical documentation.

Construction products with Declaration of Performance in accordance with *CPR* and the manufacturer's technical documentation:

Module 1: Modified mineral mortars as repair mortar for the protection and repair of concrete structures

1.1 Products used to restore and/or replace defective concrete

The requirements on essential characteristics for all intended uses in accordance with *EN 1504-3*, Tables 1 and 3, must be maintained. These are:

- Compressive strength (*EN 12190*)
- Chloride ion content (*EN 1015-17*)
- Adhesive strength by pull-off test (*EN 1542*)

1.2 Products to protect reinforcement

The requirements on essential characteristics for all intended uses in accordance with *EN 1504-7*, Table 1, must be maintained. This is

- Corrosion protection (*EN 15183*)

Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

Module 2: Adhesives based on modified mineral mortars

2.1 Products for bonding ceramic tiles as well as natural stone for internal and external installations on walls, floors and ceilings

The requirements on essential characteristics according to *EN 12004*, Table 1, must be maintained. These are:

- Tensile adhesion strength after dry storage (*EN 12004-2*)
- Tensile adhesion strength after water immersion (*EN 12004-2*)
- Tensile adhesion strength after heat ageing (*EN 12004-2*)
- Tensile adhesion strength after freeze/thaw cycles (*EN 12004-2*)

- Open time: Tensile strength (*EN 12004-2*)

Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

2.2 The minimum requirement of *EAD 040083-00-0404*

External Thermal Insulation Composite Systems with Rendering must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.). Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

Module 3: Modified mineral mortars as joint fillers

The minimum requirements of *EN 13888* must be maintained.

Module 4: Modified mineral mortars as screed, floor levelling compounds, fillers, flowing screed

The requirements on essential characteristics according to *EN 13813* 'Screed material and floor screeds – Screed materials – Properties and requirements' must be maintained. For synthetic resin screeds, these are:

- Bond strength (*EN 13892-8*)
- Reaction to fire (*EN 13501-1*)

Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

Module 5: Modified mineral mortars as levelling compounds for walls and ceilings

Module 5.1: The minimum requirements of *EN 998-1* apply. These are: - Reaction to fire (*EN 13501-1*) -

Compressive strength - Dry bulk density - Capillary water absorption - Water vapour permeability
Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

Module 5.2: The minimum requirements of *EN 13279* apply. Further essential characteristics in accordance with the manufacturer's technical documentation/declaration of performance

Module 6: Modified mineral mortars as grouts

The requirements of *DAfStb Guideline* on 'Production and use of cement-bound flow concrete and grouting mortar' (VeBMR) must be maintained.
The requirements according to *MVV TB* No. C 2.1.4.5 for "Ü-mark" must be maintained.

Module 7: Modified mineral mortars for liquid applied products for waterproofing of buildings

7.1
The requirements according to *EN 14891*, table 1, must be maintained. These are:

- initial tensile adhesion strength *EN 14891*
- Tensile adhesion strength after water contact *EN 14891*
- Waterproofing *EN 14891*
- Crack bridging ability *EN 14891*

7.2

The minimum requirements of the 'Testing principles for granting general building authority approved test certificates for waterproofing with mineral waterproofing slurries and flexible polymer modified thick coatings' (*PG MDS/FPD*) must be maintained. The characteristics for the proof of usability are to be specified in accordance with the test principles for granting general building authority test certificates for waterproofing with mineral waterproofing slurries and flexible polymer thick coatings.

7.3

The minimum requirements of the 'testing principles for granting general building authority approved test certificates for waterproofing in conjunction with ceramic tiles' (*PG A1V*) must be considered.

7.4

The minimum requirement of *EAD 030295-00-0605* must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.).

Module 8: Modified mineral mortars for waterproofing floors and/or walls inside buildings

The minimum requirement of *EAD 030352-00-0503* must be maintained. The essential characteristics are to be specified in accordance with the European technical assessment (ETA, specification no.).

Constructional data

Name	Value	Unit
Compressive strength	-	N/mm ²
Adhesive shear strength	-	N/mm ²
Water absorption	-	mg
Water vapor diffusion equivalent air layer thickness	-	m
Thermal conductivity	-	W/(mK)
Tensile bond strength	-	N/mm ²
Flexural strength	-	N/mm ²
Sound absorption coefficient (if relevant)	-	%

2.4 Delivery status

Modified mineral mortars are generally manufactured and supplied as factory-made dry mortars. Factory-made dry mortar is a finished mixture of base materials which merely requires the addition of water and/or a polymer dispersion on the building site. The products can be supplied in 1-5 kg bags, 15-25 kg sacks, big bags (1 t), minitainers (1.2 t) or as silo goods (5-15 t). Paper sacks with polyethylene lining were modelled as packaging (worst-case approach).

2.5 Base materials/Ancillary materials

Typically, the products covered by this EPD contain the following range of base materials and auxiliaries (% by mass):

Inorganic binder: ~ 2 - 98

Filler materials: ~ 0 - 90

Additives: ~ 0 - 10

Aqueous dispersion and/or dispersion powder: ~ 0 - 35

These ranges are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual cases. More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets).

Note: For companies to declare their products within the scope of this EPD it is not sufficient to simply comply with the product composition shown above. The application of this EPD is only possible for member companies of DBC, EFCC, FEICA, and IVK member associations and only for specific formulations with a total score below the declared maximum score for a product group according to the associated guidance document.

1. substances from the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC)

If this product contains substances listed in the *candidate list* (latest version) exceeding 0.1 percentage by mass, the relevant information can be found in the safety data sheet of the relevant product covered by this model EPD.

2. CMR substances in categories 1A and 1B

If this product contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass, the relevant information can be found in the safety data sheet of the relevant product covered by this model EPD.

3. Biocide products added to the construction product

If this construction product contains biocide products, the active substances, information on the concentration and/or concentration range, the product type together with information on their hazardous properties are listed in the safety data sheet of the respective product.

2.6 Manufacture

The raw materials are stored in silos, big bags or sacks in the manufacturing plant and fed gravimetrically in

accordance with the respective formula and mixed intensively. The mix is then packaged.

2.7 Environment and health during manufacturing

The state of the art involves maximum recirculation of dry waste into production. Wherever dust is incurred during production in the plant, it is directed to a filter system considering the limit values applicable for the workplace and using the corresponding extraction plants. Sack discharge stations connected to the extraction plant offer employees additional protection from dust. Most of the dust collected in the filter system and any residue incurred during production is returned to the manufacturing process.

Powder residues: Residual product is returned to the production process wherever possible.

Air: Process air is dedusted autonomously, whereby the values are far below legal requirements.

Water: The production process does not involve water. Very low volumes of water are required for laboratory tests and for sanitary facilities.

Noise: Noise level measurements have indicated that all values established within the production facility fall below the hearing protection limit of 85dB(A).

Waste: The main types of waste are powder waste, paper (paper bags) and foil. Low volumes of metal scrap (metal containers), waste oil (maintenance), wood (pallets) and commercial waste are incurred. All waste is separated, stored and redirected to the recycling circuit or disposed of.

2.8 Product processing/Installation

Modified mineral mortars can be processed both automatically and manually. The mortars are either automatically removed from a silo using a dry conveyor or manually taken from the container, mixed with water and installed. The professional liability association's rules apply as well as the respective safety data sheets pertaining to the construction products. On account of the various hydrate levels of cement, lime and calcium sulphate binding agents in the mineral mortar, the fresh mortar mixed with water is usually strongly alkaline. In the case of more extensive contact, this alkaline state can cause serious damage to eyes and skin. Therefore, any contact with eyes or skin must be avoided by taking personal protective measures, and the information outlined on the safety data sheet must be observed. Uncontrolled dust emissions should be avoided. Modified mineral mortars may not be discharged into the sewage system, surface water or groundwater. Waste incurred on the building site (packaging, pallets, residual mortar) must be collected separately. Suitable waste disposal companies dispose of packaging materials and mortar sacks and return them to the recycling circuit. Dry mortar residue is taken back by the manufacturing plants and used as a raw material. No dry mortar residue in mortar sacks is incurred. Hard mortar residue can be recycled or disposed of as building site rubble.

2.9 Packaging

A detailed description of packaging is provided in section 2.4. Empty, trickle-free paper containers and clean PE foils can be recycled.

2.10 Condition of use

A modified mineral mortar does not rot and is resistant to ageing when used in accordance with the

designated purpose of the respective products. It is a durable product which, when used as adhesive, screed, waterproofing material or repair product, makes an essential contribution towards improving building function and value.

2.11 Environment and health during use

Owing to the stable crystalline bond and firm structure achieved after curing, emissions are extremely low and harmless to health when the respective products are used in accordance with the designated purpose. No risks are known for water, air and soil if the products are used as designated. Natural ionising radiation from mineral mortar is extremely low and negligible in terms of health hazards. Options for applications in indoor areas with permanent stays by people: Evidence of the emission performance of construction products in contact with indoor air and depending on the designated use must be submitted for applications in indoor areas with permanent stays by people, e.g. in accordance with the *German AgBB* test scheme or the *GEV* (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V., Düsseldorf) *EMICODE®* marking system typically applied in Germany.

2.12 Reference service life

Modified mineral mortars decisively improve the usability of building structures and significantly extend their original service lives. The anticipated reference service life depends on the specific installation situation and the exposure associated with the product. It can be influenced by weathering as well as mechanical or chemical loads.

2.13 Extraordinary effects

Fire

In accordance with Commission Decision 94/611EC, modified mineral binding agents comprising finely distributed organic components must always be classified in reaction-to-fire class A1 'No contribution to fire' in accordance with *EN 13501-1*.

Where higher percentages of organic components are involved, it can also be assumed that at least the requirements of *EN 13501-1* are maintained for fire class E and Efl.

Fire protection

Name	Value
Building material class	-
Burning droplets	-
Smoke gas development	-

Water

No relevant volumes of water-soluble substances hazardous to water are washed out when hardened modified mineral mortars are exposed to water (e.g. flooding). Modified mineral mortar is stable in terms of structure and is not subject to any changes in form when exposed to water and drying. If non-hardened modified mineral mortars are exposed to water an increase of the pH will take place.

Mechanical destruction

The mechanical destruction of modified mineral mortars does not lead to any decomposition products which are harmful to the environment or health. Dust

incurred during de-construction should be avoided by taking the appropriate measures (e.g. humidification).

2.14 Re-use phase

Components manufactured using modified mineral mortars can usually be easily demolished. When a building is removed, the materials do not need to be treated as special waste; care should, however, be taken to ensure unmixed residual materials wherever possible. Modified mineral mortars can usually be redirected to normal building material recycling circuits. Re-use is generally in the form of recycled aggregate in building construction and civil engineering. No practical experience is currently available for reusing components comprising cementitious-based products after decommissioning.

2.15 Disposal

The portion of a modified mineral mortar applied to another construction product is rather low. These low

amounts do not play a role when the construction product is disposed of. They do not interfere with the disposal/recycling of other components/building materials.

The following waste codes according to the European List of Waste (2000/532/EC) can apply:

Mineral mortar: *EWC 17 01 01* and *EWC 10 13 14*

Mineral filler and levelling compound: *EWC 17 01 07*

Calcium sulphate-based filler and levelling compound: *EWC 17 08 02*

2.16 Further information

More information is available on the manufacturer's product or safety data sheets and is available on the manufacturer's websites or on request. Valuable technical information is also available on the associations' websites.

3. LCA: Calculation rules

3.1 Declared Unit

This EPD refers to the declared unit of 1 kg of modified mineral mortar, group 1; applied into the building with a density of 800 - 1,700 kg/m³ in accordance with the IBU *PCR part B* for Mineral Factory-Made Mortars. The results of the Life Cycle Assessment provided in this declaration have been selected from the product with the highest environmental impact (worst-case scenario).

Depending on the application, a corresponding conversion factor such as the density to convert volumetric use to mass must be taken into consideration.

The Declaration type is according to *EN 15804*: Cradle to gate with options, modules C1–C4, and module D (A1–A3, C, D) and additional modules (A4–A5).

Declared unit

Name	Value	Unit
Declared unit	1	kg
Gross density	800 - 1700	kg/m ³

3.2 System boundary

Modules A1, A2 and A3 are taken into consideration in the LCA:

- A1 Production of preliminary products
 - A2 Transport to the plant
 - A3 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables and waste treatment
 - A4 Transport to site
 - A5 Installation, product applied into the building during A5 phase operations and packaging disposal.
- The end of life for the packaging material considered is described below:
- Incineration, for materials like plastic, wood and paper.
 - C1-C2-C4-D

The building deconstruction (demolition process) takes place in the C1 module which considers energy generation and consumption of diesel and all the emissions connected with the fuel-burning process to

run the machines. After the demolition, the product is transported to the end-of-life processing (C2 module) where all the impacts related to the transport processes are considered. For precautionary principle and as a worst-case scenario, landfilling is the only end-of-life scenario considered. This is modelled by the landfill process (module C4) where the product ends its life cycle.

Module D accounts for potential benefits that are beyond the defined system boundaries. Credits are generated during the incineration of packaging that is occurring in the A5 module.

3.3 Estimates and assumptions

For this EPD formulation and production data defined and collected by FEICA were considered. Production waste was assumed to be disposed of by landfilling as a worst case.

An average of paper sacks with polyethylene lining and wooden pallets was considered in the LCA.

3.4 Cut-off criteria

All raw materials submitted for the formulations and production data were taken into consideration. The manufacture of machinery, plant and other infrastructure required for the production of the products under review was not taken into consideration in the LCA.

Transport of packaging materials is excluded.

3.5 Background data

Data from the *GaBi 10* database SP40 (2020) was used as background data.

3.6 Data quality

Representative products were applied for this EPD and the product in the group displaying the highest environmental impact was selected for calculating the LCA results. The background datasets used are less than 4 years old.

Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

The data quality of the background data is considered to be good.

3.7 Period under review

Representative formulations are valid for 2021.

3.8 Allocation

Mass allocation has been applied when primary data have been used and implemented into the LCA model.

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 *GaBi 10* database SP40 (2020) was used.

4. LCA: Scenarios and additional technical information

Characteristic product properties

Information on biogenic carbon

The packaging material contains biogenic carbon content which is presented below.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic Carbon Content in product	-	kg C
Biogenic Carbon Content in accompanying packaging	0.0194	kg C

For the preparation of building life cycle assessments, it must be taken into account that in module A5 (installation in the building) the biogenic amount of CO₂ (0.0194 kg C * 3.67 = 0.071 kg CO₂-eq.) of the packaging bound in module A1-A3 is mathematically booked out.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	1000	km
Gross weight	34 - 40	t
Payload capacity	27	t

Installation into the building (A5)

Name	Value	Unit
Other resources for packaging material	0.055	kg
Material loss	0.01	kg
Water consumption	0.0003	m ³

Material loss considers the amount of product not used during the application phase into the building. This amount is 1 % of the product and, impacts related to the production of this part are assigned to the A5 module. This percentage is considered as waste to disposal and impacts of its end of life have been considered into the LCA model and declared in A5.

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	1.121	kg
Landfilling	1.121	kg

The value above 1 kg is due to the use of water during the installation phase where 50 % of water evaporate while 50 % remain in the product.

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

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	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	ND	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 kg of modified mineral mortar, group 1

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C4	D
GWP-total	[kg CO ₂ -Eq.]	4.88E-1	5.06E-2	1.05E-1	3.12E-4	1.39E-2	1.71E-2	-3.50E-2
GWP-fossil	[kg CO ₂ -Eq.]	5.58E-1	5.00E-2	1.36E-2	2.98E-4	1.33E-2	1.70E-2	-3.49E-2
GWP-biogenic	[kg CO ₂ -Eq.]	-6.95E-2	1.46E-4	9.10E-2	1.38E-5	6.08E-4	5.38E-5	-8.21E-5
GWP-luluc	[kg CO ₂ -Eq.]	4.13E-4	4.05E-4	5.72E-6	7.17E-9	3.13E-7	4.89E-5	-2.45E-5
ODP	[kg CFC11-Eq.]	2.81E-11	6.01E-18	2.81E-13	3.18E-20	1.39E-18	6.30E-17	-3.66E-16
AP	[mol H ⁺ -Eq.]	1.80E-3	1.50E-4	3.50E-5	4.04E-6	4.19E-5	1.22E-4	-4.90E-5
EP-freshwater	[kg P-Eq.]	9.16E-7	1.52E-7	1.49E-8	6.45E-11	2.81E-9	2.92E-8	-4.52E-8
EP-marine	[kg N-Eq.]	3.45E-4	6.68E-5	8.93E-6	1.83E-6	1.92E-5	3.14E-5	-1.27E-5
EP-terrestrial	[mol N-Eq.]	3.72E-3	7.48E-4	1.14E-4	2.01E-5	2.12E-4	3.45E-4	-1.36E-4
POCP	[kg NMVOC-Eq.]	1.33E-3	1.32E-4	2.83E-5	5.51E-6	3.80E-5	9.51E-5	-3.64E-5
ADPE	[kg Sb-Eq.]	5.74E-8	3.59E-9	7.92E-10	9.03E-12	3.94E-10	1.53E-9	-5.74E-9
ADPF	[MJ]	9.91E+0	6.66E-1	1.24E-1	4.27E-3	1.86E-1	2.23E-1	-5.92E-1
WDP	[m ³ world-Eq deprived]	8.79E-2	4.47E-4	2.42E-2	5.90E-7	2.58E-5	1.78E-3	-3.63E-3

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 kg of modified mineral mortar, group 1

Indicator	Unit	A1-A3	A4	A5	C1	C2	C4	D
PERE	[MJ]	9.81E-1	3.74E-2	7.42E-1	1.35E-5	5.88E-4	2.92E-2	-1.30E-1
PERM	[MJ]	7.21E-1	0.00E+0	-7.21E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.70E+0	3.74E-2	2.15E-2	1.35E-5	5.88E-4	2.92E-2	-1.30E-1
PENRE	[MJ]	8.86E+0	6.67E-1	2.01E-1	4.28E-3	1.87E-1	2.23E-1	-5.92E-1
PENRM	[MJ]	1.05E+0	0.00E+0	-8.66E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	9.91E+0	6.67E-1	1.14E-1	4.28E-3	1.87E-1	2.23E-1	-5.92E-1
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	2.46E-3	4.33E-5	5.71E-4	2.42E-8	1.05E-6	5.63E-5	-1.50E-4

Caption: 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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 kg of modified mineral mortar, group 1

Indicator	Unit	A1-A3	A4	A5	C1	C2	C4	D
HWD	[kg]	2.60E-5	3.10E-8	2.60E-7	4.15E-13	1.81E-11	3.40E-9	-2.36E-10
NHWD	[kg]	3.12E-2	1.02E-4	1.44E-2	4.37E-7	1.91E-5	1.12E+0	-2.74E-4
RWD	[kg]	2.46E-4	8.25E-7	3.74E-6	4.59E-9	2.00E-7	2.54E-6	-4.43E-5
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	1.48E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	2.66E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 kg of modified mineral mortar, group 1**

Indicator	Unit	A1-A3	A4	A5	C1	C2	C4	D
PM	[Disease Incidence]	ND	ND	ND	ND	ND	ND	ND
IRP	[kBq U235-Eq.]	ND	ND	ND	ND	ND	ND	ND
ETP-fw	[CTUe]	ND	ND	ND	ND	ND	ND	ND
HTP-c	[CTUh]	ND	ND	ND	ND	ND	ND	ND
HTP-nc	[CTUh]	ND	ND	ND	ND	ND	ND	ND
SQP	[-]	ND	ND	ND	ND	ND	ND	ND

Caption PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Potential Human exposure efficiency relative to U235, Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and (from) some construction materials is also not measured by this indicator.

ADP minerals & metals, ADP fossil, WDP, ETF-fw, HTP-c, HTP-nc, SQP, Disclaimer 2 – 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 (suggested by EN15804, table 4) are not declared in the EPD. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high and as there is limited experience with the indicator (see ILCD classification in EN 15804, table 5). For this reason, results based on these indicators are not considered suitable for a decision-making process and are thus not declared in the EPD.

6. LCA: Interpretation

The majority of impacts are associated with the production phase (A1-A3). The most significant contribution to the production phase impacts is the upstream production of raw materials as the main driver. Besides the cement also the dispersion powder influences the results significantly, although this is only used for up to 8 % of the total composition. Significant contributions to Primary Energy Demand – Non-renewable (PENRT) derive from the energy resources used in the production of raw materials. The largest contributor to Primary Energy Demand – Renewable (PERT) is the consumption of renewable energy resources required for the generation and supply of electricity. During manufacturing (A1-A3) some influence also arises due to the wooden pallets and paper used as packaging that need solar energy for photosynthesis. It should be noted that Primary Energy Demand – Renewable (PERT) generally represents a small percentage of the production phase primary energy demand with the bulk of the demand coming from non-renewable energy resources.

In all EPDs, CO₂ is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NO_x and SO₂ contribute the largest share.

Transportation to the construction site (A4) and the installation process (A5) make a minor contribution to almost all impacts. The only exception is a relevant influence of carbon dioxide emissions in module A5 to Global Warming Potential (GWP) due to the incineration of the packaging materials plastic, paper and pallets.

In module A4, transport to construction site, values for Eutrophication (freshwater, marine and terrestrial) have an impact due principally to the emission of phosphate. Furthermore, climate change from land use change is influenced by transport processes, due to the diesel production used as fuel, because part of this diesel has been produced from bio-based raw materials.

The end-of-life phases have a negligible influence on all impacts.

7. Requisite evidence

Leaching

Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some member states require special documentation on leaching for specific areas of application. This documentation has to be provided separately and is specific to the product in question.

If of relevance for the application (usually if the products are used outside of buildings) the leaching behaviour has to be measured e.g. according to DIN EN 12457/1--4 or DIN EN 14405 combined with the Council decision 2003/33/EC.

8. References

EN 998-1

EN 998-1:2016, Specification for mortar for masonry – Part 1: Rendering and plastering mortar

EN 1015-17

EN 1015-17:2005-01, Methods of test for mortar for masonry – Part 17: Determination of water-soluble chloride content of fresh mortars

EN 1504-3

EN 1504-3:2005-12, Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 3: Structural and non-structural repair

EN 1504-7

EN 1504-7:2006-08, Products and systems for the protection and repair of concrete structures – Definitions, requirements, quality control and evaluation of conformity – Part 7: Reinforcement corrosion protection

EN 1542

EN 1542:1999-07, Products and systems for the protection and repair of concrete structures – Test methods – Measurement of bond strength by pull-off

EN 12004

EN 12004:2012, Adhesives for tiles – Requirements, evaluation of conformity, classification and designation

EN 12004-2

EN 12004-2:2017, Adhesives for ceramic tiles - Part 2: Test methods

EN 12190

EN 12190:1998-12, Products and systems for the protection and repair of concrete structures – Test methods – Determination of compressive strength of repair mortar

DIN EN 12457-1

DIN EN 12457-1:2003-01, Characterization of waste - Leaching; Compliance test for leaching of granular and sludges - Part 1: One stage batch test at a liquid to solid ratio of 2 l/kg with particle size below 4 mm (without or with size reduction)

DIN EN 12457-2

DIN EN 12457-2:2003-01, Characterization of waste - Leaching; Compliance test for leaching of granular and sludges - Part 2: One stage batch test at a liquid to solid ratio of 10 l/kg with particle size below 4 mm (without or with size reduction)

DIN EN 12457-3

DIN EN 12457-3:2021-03, Characterization of waste - Leaching - Compliance test for leaching of granular waste materials and sludges - Part 3: Two stage batch test at a liquid to solid ratio of 2 l/kg and 8 l/kg for materials with high solid content with particle size below 4 mm (without or with size reduction)

DIN EN 12457-4

DIN EN 12457-4:2003-01, Characterization of waste - Leaching; Compliance test for leaching of granular waste materials and sludges - Part 4: One stage batch test at a liquid to solid ratio of 10 l/kg for materials with

particle size below 10 mm (without or with limited size reduction)

EN 13279

EN 13279-1:2008, Gypsum binders and gypsum plasters – Part 1: Definitions and requirements

EN 13501-1

EN 13501-1:2018, Fire classification of construction products and building products – Part 1: Classification using data from reaction to fire tests

EN 13813

EN 13813:2002-10, Screed material and floor screeds – Screed materials – Properties and requirements

EN 13888

EN 13888:2009, Grout for tiles – Requirements, evaluation of conformity, classification and designation

EN 13892-8

EN 13892-8:2003-02, Methods of test for screed materials – Part 8: Determination of bond strength

ISO 14025

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

DIN EN 14405

DIN EN 14405:2017-05, Characterization of waste - Leaching behaviour test - Up-flow percolation test (under specified conditions)

EN 14891

EN 14891:2012-04, Liquid-applied water impermeable products for use beneath ceramic tiling bonded with adhesives – Requirements, test methods, evaluation of conformity, classification and designation

EN 15183

EN 15183:2006-11, Products and systems for the protection and repair of concrete structures – Test methods – Corrosion protection test

EN 15804

EN 15804+A2+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EAD 030295-00-0605

EAD 030295-00-0605, Flexible polymer modified mineral thick coating

EAD 030352-00-0503

EAD 030352-00-0503:2019:01, Liquid applied watertight covering kits for wet room floors and/or walls

EAD 040083-00-0404

EAD 040083-00-0404:2013, External Thermal Insulation Composite Systems with Rendering

96/603/EC

Commission decision of 4 October 1996 for specifying a directory of products to be classified as category A "No contribution to fire" in accordance with decision 94/611/EC on construction products for implementing Article 20 of Directive 89/106/EEC

2000/532/EC

Commission decision dated 3 May 2000 replacing decision 94/3/EC on a waste directory in accordance with Article 1 a) of Council Directive 75/442/EEC on waste and Council decision 94/904/EC on a directory of hazardous waste in terms of Article 1, paragraph 4 of Directive 91/689/EEC on hazardous waste

2003/33/EC:

Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC

Candidate list

Candidate List of substances of very high concern for Authorisation, published in accordance with Article 59(10) of the REACH Regulation, ECHA, www.echa.europa.eu/candidate-list-table

CPR

CPR Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

DAfStb Guideline

DAfStb Guideline on 'Production and use of cement-bound flow concrete and grouting mortar' (VeBMR), 2019-07

Decopaint Directive

Directive 2004/42/CE of the European Parliament and the council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC

EWC 101314

2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Waste concrete and concrete sludge

EWC 170101

2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Concrete

EWC 170107

2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Mixtures of concrete, bricks, tiles and ceramics

EWC 170802

2000/532/EC European Waste Catalogue / Ordinance on European List of Wastes: Gypsum based construction metals e.g. for plasterboard

GaBi 10

GaBi 10: Software and database for comprehensive analysis. LBP, University of Stuttgart and Sphera, 2020

GaBi 10 documentation

Gabi 10: documentation of GaBi 10 data sets from the data base for Life Cycle Engineering LBP, University of Stuttgart and Sphera, <http://documentation.gabi-software.com/>, 2020

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MVV TB

Ü-mark in accordance with 'Model Administrative Order laying down Technical Building Regulations' (MVV TB) no. C 2.1.4.5

PCR Part A

Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, Version 1.1, Institut Bauen und Umwelt e.V., 2021-01

PCR Part B

Product Category Rules for Construction Products, Part B: Mineral Factory-Made Mortars, 2017-11

PG AIV

Testing principles regarding the issuing of general building authority test certificates for waterproofing with waterproofing in conjunction with ceramic tiles (PG-AIV:2018-03)

PG MDS/FPD

Testing principles regarding the issuing of general building authority test certificates for waterproofing with mineral waterproofing slurries and flexible polymer thick coatings (PG-MDS/FPD:2016-11)

REACH

Directive (EG) No. 1907/2006 of the European Parliament and of the Council dated 18 December 2006 on the registration, evaluation, approval and restriction of chemical substances (REACH), for establishing a European Agency for chemical substances, for amending Directive 1999/45/EC and for annulment of Directive (EEC) No. 793/93 of the Council, Directive (EC) No. 1488/94 of the Commission, Guideline 76/769/EEC of the Council and Guidelines 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC of the Commission.

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