

Environmental Product Declaration



Environmental Product Declaration for packaged cement blended products produced by Roman Cement Mixes at their Baltimore facility



ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers packaged cement blend products produced by Roman Cement Mixes. Declared unit: 1 kg of dry blended and bagged product with packaging
Declaration Owner:	Roman Cement Mixes
	200 Frankfurst Ave
	Baltimore, Maryland
	www.romacementmixes.com
Program Operator:	Labeling Sustainability
	11670 W Sunset Blvd.
	Los Angeles, CA 90049
	www.labelingsustainability.com
Product Category Rule:	ISO 21930:2017 Sustainability in buildings and civil engineering works Core rules for environmental product declarations of construction products and services.
	PCR Program Operator: International Organization for Standardization
	PCR review was conducted by: Technical Committee: ISO/TC 59/SC 17 Sustainability in buildings and civil engineering works
Independent LCA Reviewer and EPD Verifier:	This declaration was independently verified in accordance with ISO 14025:2006.
	Independent verification of the declaration, according to ISO 14025:2006
	Internal <input type="checkbox"/> ; External <input checked="" type="checkbox"/>
	Third Party Verifier
	Geoffrey Guest, Certified 3rd Party Verifier under the Labeling Sustainability Program (www.labelingsustainability.com), CSA Group (www.csaregistries.ca).
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COMPANY DESCRIPTION

Roman Cement Mixes offer high quality, reliable cementitious materials for everyday needs. These premium concretes, mortars, and grouts provide best in class solutions for any problem, whether it be commercial or residential grade. Roman Cement Mixes are formulated to meet the highest performance standards in the packaged cementitious materials industry.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, www.labelingsustainability.com. This level of study is in accordance with EPD Product Category Rule (PCR) for Packaged Cement Blends published by the International Standards Organization (ISO) 21930:2017 Sustainability in buildings and civil works - Core rules for EPDs of construction products and services; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Roman Cement from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Roman Cement by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Roman Cement's license to operate in the community. The intended audience for this LCA report is Roman Cement Mixes employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities.

DESCRIPTION OF PRODUCT AND SCOPE

This EPD covers fifteen (15) different Roman Cement Mixes at the Baltimore facility. Packaged cementitious materials are manufactured by drying bulk-delivered aggregates, combining the dried sand and/or gravel with cement and admixtures. The bulk aggregates and cements are blended with the admixtures and then packaged into either small or bulk bags, then placed on pallets and wrapped with shrink wrap

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material



to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

PACKAGED CEMENT BLENDS DESIGN SUMMARY

The following tables provide a list of the packaged cement blends products considered in this EPD along with key performance parameters.

Table 1: Declared products with All declared products considered in this environmental product declaration

Prod#	Unique name/ID	Short description	Product type	Unit	Density, dry kg/Unit
1	Roman Concrete Mix 80lb bag	Contractor grade, high strength 4000 psi concrete mix that exceeds ASTM C387 specifications	Roman Cement Mixes	Kg	1.00
2	Roman V Crete 80lb bag	Premium, contractor grade 5000 psi concrete mix that exceeds STM C387 specifications	Roman Cement Mixes	Kg	1.00
3	Roman Fast Setting Concrete 50lb bag	Premium, fast setting concrete mix that meets ASTM C387	Roman Cement Mixes	Kg	1.00
4	Roman Type S Mortar 80lb bag	Premium Type S Mortar that meets or exceeds ASTM C270	Roman Cement Mixes	Kg	1.00
5	Roman Sand Mix 80lb bag	5000 psi blend of sand and Portland cement. Exceeds specs for ASTM C 387.	Roman Cement Mixes	Kg	1.00
6	Roman Play Sand 50lb bag	Finely graded premium sand that is light in color and has been dried and sterilized.	Roman Cement Mixes	Kg	1.00
7	Roman Mason Sand 70lb bag	Finely graded premium sand that is light in color and has been dried and sterilized.	Roman Cement Mixes	Kg	1.00
8	Scalped Concrete Sand 55lb bag	Properly graded premium concrete sand that has been dried and sterilized.	Roman Cement Mixes	Kg	1.00
9	Roman Masonry Block fill Grout - Fine Grade 80lb bag	Certified to exceed ASTM C 476 specifications for reinforced masonry construction and ASTM C 279 for mortar in unit masonry.	Roman Cement Mixes	Kg	1.00
10	Roman Masonry block fill Grout - Coarse Grade 80lb bag	Certified to exceed ASTM C 476 specifications for reinforced masonry construction and ASTM C 279 for mortar in unit masonry.	Roman Cement Mixes	Kg	1.00
11	Roman All-Purpose Sand 55lb bag	Properly graded premium concrete sand that has been dried and sterilized.	Roman Cement Mixes	Kg	1.00



12	Stone Veneer Mortar 60lb bag	Premium material used to set artificial and natural stone veneers	Roman Cement Mixes	Kg	1.00
13	Glass Block Mortar 50lb bag	A specifically formulated blend of light sand, cement, lime and other additives designed to provide a decorative, waterproof joint. Exceeds the performance requirements of ASTM C270 for Type S Mortar.	Roman Cement Mixes	Kg	1.00
14	Bay Blend Concrete 80lb bag	Premium post mix for general applications	Roman Cement Mixes	Kg	1.00
15	Roman Type N Mortar 80lb bag	Premium Type N Mortar that meets or exceeds ASTM C270	Roman Cement Mixes	Kg	1.00

PACKAGED CEMENT BLENDS DESIGN COMPOSITION

The following figures provide mass breakdown (kg per functional unit) of the material composition of each flooring design considered. Please note that the presented breakdown has been randomly altered by +/-10% and is therefore only an approximation; this manipulation is to ensure confidentiality.

Table 2: Ready bag concrete composition.

Product Components	Raw Material, weight%
Cement	Proprietary
Mineral Additions (River sand and Gravel)	30-60.00
Others	0.01-5.00
Total	100.00

A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES

The following table provides a list of the raw material inputs (module A1) across all products considered, their recyclability content and assumed material losses.

Table 3: Module A1 raw material inputs, the recyclability content and assumed material losses (dry basis)

Product.name	Mix.category	Primary.content	Post.industrial.content	Post.consumer.content	Material.losses
Mason Sand	Limestone, unprocessed	100%	0%	0%	2%
Concrete Sand(sand)	Sand	100%	0%	0%	2%
Type II Cement	Cement, Portland	100%	0%	0%	2%
Crushed Stone (limestone)	Limestone, unprocessed	100%	0%	0%	2%



Pea Gravel (limestone)	Limestone, unprocessed	100%	0%	0%	2%
Fly Ash	Fly ash and scrubber sludge	100%	0%	0%	2%
Crystalline silica	Silica sand	100%	0%	0%	2%
Silica dust	Silica dust	100%	0%	0%	2%
Hydrated limestone	Limestone, unprocessed	100%	0%	0%	2%

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-grave system boundary considered in this study:

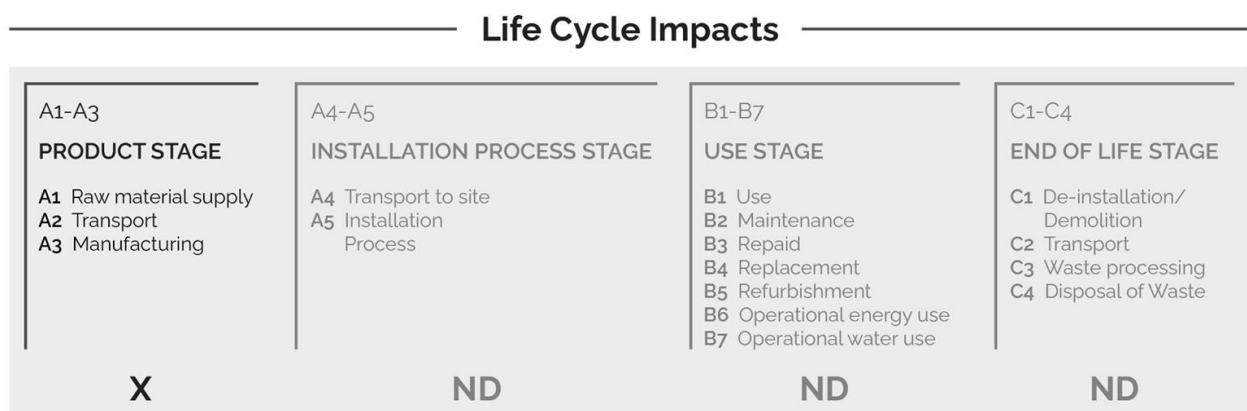


Figure 1: **General life cycle phases for consideration in a construction works system.**

This is a Cradle-to-gate life cycle assessment, and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacture the declared products and to operate the facility.

As according to the PCR, the following figure illustrates the general activities and input requirements for producing packaged cement blends products and is not necessarily exhaustive.



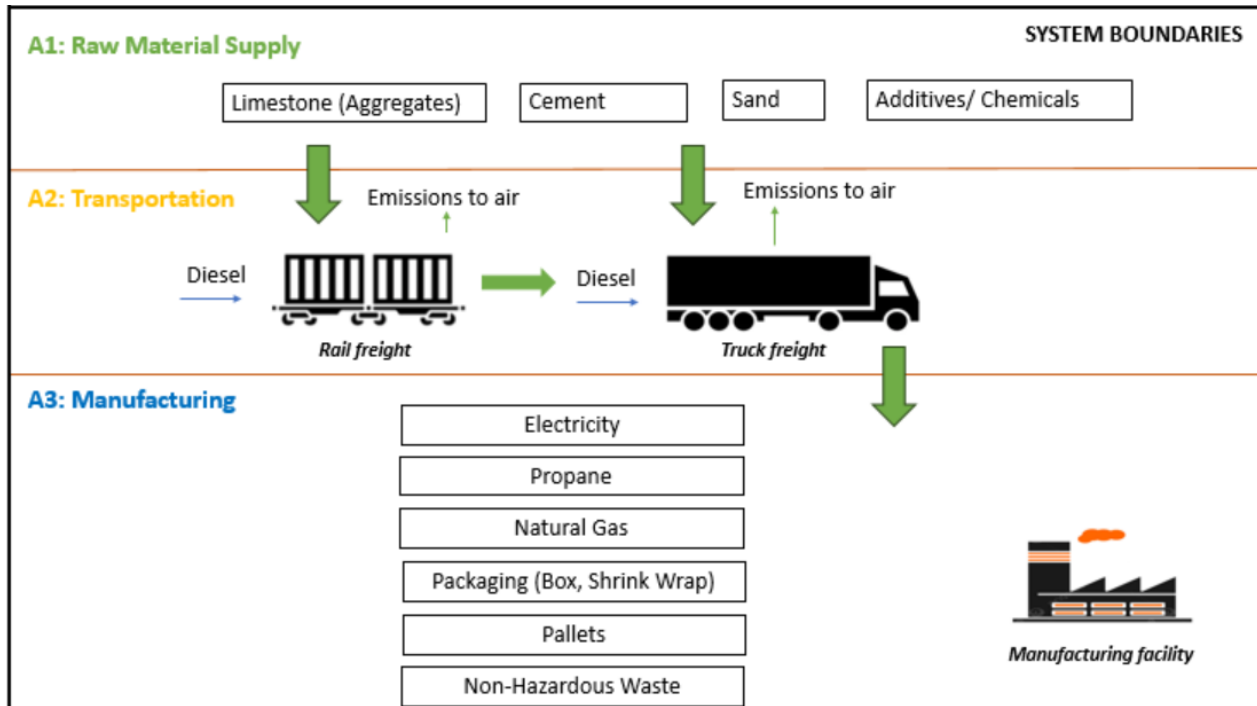


Figure 2: General system inputs considered in the product system and categorized by modules in scope

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure.
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment.
- Personnel-related activities (travel, furniture, office supplies);
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Roman Cement Mixes, is located at their Baltimore facility in the Mid-Atlantic. All operating data is formulated using the actual data from the Roman Cement plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.10 database and a local EPD database in combination with primary data from Roman Cement Mixes were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.





CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

Table 4: Reused or recycled components/materials at the A3 facility site

Component/material for re-use/recycling	Value	Units	Re-used/recycled on-site or off-site
Pallets	290,390.6	kg	On-site

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: Roman Cement Mixes provided all the raw material data for the reference year 2023. Raw material transportation is based on the actual distance from the manufacturer. The transportation was reported using Roman Cement Mixes primary data that consisted of the actual distance, mode of transport, and location in the city, state, and country. Packaged cementitious materials are manufactured by drying bulk-delivered aggregates, combining the dried sand and/or gravel with cement and admixtures. The bulk aggregates and cements are blended with the admixtures and then packaged into either small or bulk bags, then placed on pallets and wrapped with shrink wrap. The provision of raw materials relies on two modes of transportation: barge freight and truck freight.

Electricity: Electricity consumption values are for the Roman Cement Mix Baltimore facility. These values were directly reported from plant records. 80% of the energy goes to packaging, 20% to dryer operations.

Process/space heating: The reported natural gas consumption value is based on the Baltimore Plant primary information from utility bills for the reporting period.

Fuel required for machinery: Machinery-related fuel requirements were determined from direct Baltimore plant information.

Waste generation: Waste generation values are directly reported from the Baltimore operations for non-hazardous waste. No other waste is generated on-site at the facility. Transportation defaults were used because the driver's route and ultimate destination are unknown. Therefore, the exact mileage could not be confirmed by the waste hauler. Transportation for waste in the end-of-life modules also uses default distances set by the PCR.

Recovered energy: No on-site energy is recovered on site.



Recycled/reused material/components: No recycling is assumed based on information in this cradle-to-gate study. pallets are reused on site.

Module A1 material losses: Due to lack of data, default loss factors of 2% were assumed.

Direct A3 emissions accounting: Direct emissions were modeled with the best available ecoinvent processes (see LCI list).

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 5: LCI inputs assumed for module A1 (i.e., raw material supply)

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Crystalline silica	silica sand production/silica sand/RoW/kg	ecoinvent v3.10 in 2024	Wyoming	2024	2	3	2	3	3
Crushed Stone (limestone)	limestone quarry operation/limestone, unprocessed/RoW/kg	ecoinvent v3.10 in 2024	Maryland	2024	2	3	2	3	3
Concrete Sand(sand)	sand quarry operation, extraction from riverbed/sand/BR/kg	ecoinvent v3.10 in 2024	Maryland	2024	2	3	2	3	3
Silica dust	Waste input produced off-site	See A3 inputs	Wyoming	See A3 inputs	2	A3	2	A3	A3
Type IL Cement	Production of cement, general use cement Type IL/Type IL/US/kilogram	ecoinvent v3.10 in 2024	Maryland	2024	2	3	2	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.



Completeness: All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.10 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product and co-products outputs, returned and recovered Packaged Cement Blends materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.10 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process levels to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine-readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Packaged Cement Blends LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Packaged Cement Blends product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2023-01-01 to 2023-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.10 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.



ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

Table 6: Life cycle impact categories and life cycle inventory metrics

ID	LCIA indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP100	kg CO ₂ -eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO ₂ -eq
4	Eutrophication: eutrophication potential	EP	kg N-eq
5	Smog formation potential	SFP	kg O ₃ -eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADP _{fossil}	MJ
Inventory metrics			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	kg
11	Inventory indicators ISO21930: use of secondary material	SM	MJ
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m ³
15	Inventory indicators ISO21930: hazardous waste disposed	HWD	kg
16	Inventory indicators ISO21930: non-hazardous waste disposed	NHWD	kg
17	Inventory indicators ISO21930: high-level radioactive waste disposed	HLRW	kg
18	Inventory indicators ISO21930: intermediate and low-level radioactive waste disposed	ILLRW	kg
19	Inventory indicators ISO21930: materials for recycling	MR	kg
20	Inventory indicators ISO21930: materials for energy recovery	MER	kg
21	Inventory indicators ISO21930: exported energy - electricity	EE _{el}	MJ
22	Inventory indicators ISO21930: exported energy - heat	EE _{heat}	MJ



It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel).
- Renewable primary resources as material.
- Non-renewable primary resources as energy (fuel).
- Non-renewable primary resources as material.
- Secondary Materials.
- Renewable secondary fuels.
- Non-renewable secondary fuels.
- Recovered energy.
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility.
- Toxicological aspects.
- Emissions from land use change [GWP 100 (land-use change)].
- Hazardous waste disposed.
- Non-hazardous waste disposed.
- High-level radioactive waste.
- Intermediate and low-level radioactive waste.
- Components for reuse.
- Materials for recycling.
- Materials for energy recovery.
- Recovered energy exported from the product system.

TOTAL IMPACT SUMMARY

The following table reports the total LCA results for each product produced at the given packaged cement blends facility on a per 1 kg of dry blended and bagged product with packaging basis.

Table 7: **Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 1 kg of dry blended and bagged product with packaging basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADP _{fossil}
Unit	kg CO ₂ -eq	kg CFC-11-eq	kg SO ₂ -eq	kg N-eq	kg O ₃ -eq	MJ
Minimum	0.0116	1.83e-10	8.93e-05	1.29e-05	0.00285	0.145
Maximum	0.214	1.49e-06	0.00041	0.000309	0.0507	8.71
Mean	0.137	8.97e-07	0.000287	0.000194	0.0321	5.41
Median	0.164	1.08e-06	0.000328	0.000235	0.0384	6.6
Roman Concrete Mix 80lb bag	0.134	8.75e-07	0.000282	0.000189	0.0314	5.28
Roman V Crete 80lb bag	0.158	1.07e-06	0.00032	0.000227	0.0376	6.38





Roman Fast Setting Concrete 50lb bag	0.164	1.12e-06	0.000328	0.000237	0.0391	6.64
Roman Type S Mortar 80lb bag	0.214	1.41e-06	0.00041	0.000304	0.0489	8.5
Roman Sand Mix 80lb bag	0.197	1.45e-06	0.000373	3e-04	0.0492	8.39
Roman Play Sand 50lb bag	0.0329	8.49e-10	0.000133	1.98e-05	0.00408	0.481
Roman Mason Sand 70lb bag	0.0329	8.48e-10	0.000133	1.98e-05	0.00408	0.48
Scalped Concrete Sand 55lb bag	0.0116	1.83e-10	8.93e-05	1.29e-05	0.00285	0.145
Roman Masonry Blockfill Grout - Fine Grade 80lb bag	0.201	1.48e-06	0.00038	0.000305	0.05	8.55
Roman Masonry Blockfill Grout - Coarse Grade 80lb bag	0.21	1.49e-06	0.000396	0.000309	0.0507	8.71
Roman All Purpose Sand 55lb bag	0.0137	2.45e-10	9.35e-05	1.36e-05	0.00296	0.176
Stone Veneer Mortar 60lb bag	0.203	1.38e-06	0.000389	0.00029	0.0477	8.22
Glass Block Mortar 50lb bag	0.169	1.08e-06	0.000338	0.000235	0.0384	6.6
Bay Blend Concrete 80lb bag	0.106	6.85e-07	0.000237	0.000151	0.0251	4.14
Roman Type N Mortar 80lb bag	0.214	1.41e-06	0.00041	0.000304	0.0489	8.5

b) Resource Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
Minimum	0.00543	0.0013	0.00545	4.97e-05	0.000126	3.56e-05	3.71e-05	5.2e-05
Maximum	2.26	0.00247	2.24	0.000106	0.0241	0.000342	0.00647	0.00465
Mean	1.37	0.00166	1.35	7.03e-05	0.0146	0.000222	0.00392	0.00283
Median	1.65	0.00153	1.64	6.52e-05	0.0176	0.000272	0.00474	0.00335
Roman Concrete Mix 80lb bag	1.34	0.00153	1.32	6.52e-05	0.0142	0.000216	0.00383	0.00277
Roman V Crete 80lb bag	1.63	0.00153	1.61	6.51e-05	0.0173	0.000256	0.00466	0.00335
Roman Fast Setting Concrete 50lb bag	1.7	0.00183	1.68	7.82e-05	0.0181	0.000272	0.00487	0.00349
Roman Type S Mortar 80lb bag	2.15	0.00153	2.13	6.52e-05	0.0229	0.000327	0.00617	0.00435
Roman Sand Mix 80lb bag	2.21	0.00152	2.19	6.47e-05	0.0235	0.000336	0.00633	0.00459



Roman Play Sand 50lb bag	0.00602	0.00185	0.00604	7.92e-05	0.000159	3.92e-05	4.41e-05	5.22e-05
Roman Mason Sand 70lb bag	0.00583	0.00175	0.00585	7.44e-05	0.000157	3.69e-05	4.41e-05	5.2e-05
Scalped Concrete Sand 55lb bag	0.00543	0.00167	0.00545	7.1e-05	0.000126	3.56e-05	3.71e-05	0.000217
Roman Masonry Blockfill Grout - Fine Grade 80lb bag	2.25	0.00153	2.23	6.52e-05	0.0239	0.000341	0.00643	0.00465
Roman Masonry Blockfill Grout - Coarse Grade 80lb bag	2.26	0.00153	2.24	6.52e-05	0.0241	0.000342	0.00647	0.00462
Roman All Purpose Sand 55lb bag	0.00554	0.00171	0.00556	7.36e-05	0.000129	3.66e-05	3.78e-05	0.000202
Stone Veneer Mortar 60lb bag	2.1	0.00156	2.08	6.7e-05	0.0223	0.000321	0.00601	0.00424
Glass Block Mortar 50lb bag	1.65	0.00247	1.64	0.000106	0.0176	0.000279	0.00474	0.00335
Bay Blend Concrete 80lb bag	1.05	0.00153	1.04	6.51e-05	0.0112	0.000176	0.00301	0.00224
Roman Type N Mortar 80lb bag	2.15	0.0013	2.13	4.97e-05	0.0229	0.000321	0.00617	0.00435

c) Waste/output Inventory Metrics:

Indicator/LCI Metric	HWD	NHWD	HLRW	ILLRW	MR	MER	EEel	EEheat
Unit	kg	kg	kg	kg	kg	kg	MJ	MJ
Minimum	0.000255	0.00406	1.02e-08	2.82e-08	7.34e-06	1.5e-08	1.79e-05	1.92e-05
Maximum	0.0829	1.63	2.51e-06	6.02e-06	0.00032	1.26e-06	0.00324	0.00316
Mean	0.0502	0.984	1.52e-06	3.65e-06	0.000197	7.67e-07	0.00196	0.00192
Median	0.0606	1.19	1.84e-06	4.41e-06	0.00024	9.28e-07	0.00237	0.00231
Roman Concrete Mix 80lb bag	0.049	0.961	1.49e-06	3.56e-06	0.000192	7.47e-07	0.00192	0.00187
Roman V Crete 80lb bag	0.0597	1.17	1.81e-06	4.34e-06	0.000232	9.08e-07	0.00234	0.00228
Roman Fast Setting Concrete 50lb bag	0.0624	1.22	1.89e-06	4.53e-06	0.000244	9.49e-07	0.00244	0.00238
Roman Type S Mortar 80lb bag	0.0789	1.55	2.39e-06	5.73e-06	0.000305	1.2e-06	0.00308	0.00301
Roman Sand Mix 80lb bag	0.081	1.59	2.46e-06	5.88e-06	0.000313	1.23e-06	0.00317	0.00309





Roman Play Sand 50lb bag	0.000407	0.00659	1.32e-08	3.71e-08	8.67e-06	2.11e-08	2.11e-05	2.3e-05
Roman Mason Sand 70lb bag	0.000407	0.00658	1.32e-08	3.7e-08	8.33e-06	2.07e-08	2.11e-05	2.3e-05
Scalped Concrete Sand 55lb bag	0.000255	0.00406	1.02e-08	2.82e-08	7.34e-06	1.5e-08	1.79e-05	1.92e-05
Roman Masonry Blockfill Grout - Fine Grade 80lb bag	0.0824	1.62	2.5e-06	5.98e-06	0.000318	1.25e-06	0.00322	0.00314
Roman Masonry Blockfill Grout - Coarse Grade 80lb bag	0.0829	1.63	2.51e-06	6.02e-06	0.00032	1.26e-06	0.00324	0.00316
Roman All Purpose Sand 55lb bag	0.00027	0.0043	1.05e-08	2.9e-08	7.41e-06	1.57e-08	1.82e-05	1.95e-05
Stone Veneer Mortar 60lb bag	0.077	1.51	2.33e-06	5.59e-06	0.000298	1.17e-06	0.00301	0.00293
Glass Block Mortar 50lb bag	0.0606	1.19	1.84e-06	4.41e-06	0.00024	9.28e-07	0.00237	0.00231
Bay Blend Concrete 80lb bag	0.0384	0.753	1.17e-06	2.79e-06	0.000152	5.88e-07	0.00151	0.00147
Roman Type N Mortar 80lb bag	0.0789	1.55	2.39e-06	5.73e-06	0.000305	1.2e-06	0.00308	0.00301

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

REFERENCES

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products



EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products

Other References:

- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf

