STANDARD & LIGHTWEIGHT CMU

Block manufactured shall conform to the finish requirements of ASTM C90-08.

TECHNICAL DATA

Physical Properties & Ratings*

Weight: A standard 8x8x16 inch, thru-hole Partanna Masonry Unit weight is 38 lb (17.2 kg). A lightweight Partanna masonry unit is 26 lb (11.8 kg).

Density: 136.8 pcf for standard 8x8x16 inch unit; 96.5 pcf for a lightweight 8x8x16 inch unit

Compressive Strength: 3,674 psi for standard 8x8x16 inch unit; 3,290 psi for a lightweight 8x8x16 inch unit

Fire Resistance Rating: for an 8-inch CMU (unit only, not wall assembly) with empty cores: 1 ¾ hours for standard 8x8x16 inch unit, with an equivalent thickness of 3.8 inches.

Thermal Resistance (R) and Transmittance (U) Ratings: For 8-inch CMU, 85% density with empty cores

R = 3.00 hr ft2 °F/Btu
U = 0.333 Btu/ (hr ft2 °F)

UL Greenguard: Gold (Highest Rating)

Positive Environmental Impacts
kg CO_2-eq Avoided: 3.08 kg per block
kg CO_2-eq Removed: 11.2 kg per block

ASTM Compliance

ASTM C-90 Compressive Strength of Concrete Masonry – Composition conforms to the density, absorption and compressive strength requirements (see ASTM Table 2 below)

ASTM C642 Water Absorption, Density, Voids in Hardened Concrete – Composition conforms

ASTM C33/C33M for aggregates – Composition conforms

C 90 – 12

TABLE 2 Strength, Absorption, and Density Classification Requirements

Density Classification	Oven-Dry Density of Concrete, lb/ft³(kg/m³)	Maximum Water Absorption, lb/ft³(kg/m³)		Minimum Net Area Compressive Strength, lb/in²(MPa)	
	Average of 3 Units	Average of 3 Units	Individual Units	Average of 3 Units	Individual Units
Lightweight	Less than 105 (1680)	18 (288)	20 (320)	1900 (13.1)	1700 (11.7)
Medium Weight	105 to less than 125 (1680–2000)	15 (240)	17 (272)	1900 (13.1)	1700 (11.7)
Normal Weight	125 (2000) or more	13 (208)	15 (240)	1900 (13.1)	1700 (11.7)

* Test reports are available upon request.

EXECUTION

The installer is the final and most essential quality control inspector of these products. All units should be inspected prior to installation for tolerance, color and quality. Installation of any Partanna Block manufactured unit into the wall assumes inspection and approval of the products. Use constitutes acceptance.

Laying Masonry Walls
When installing pull blocks from more than one pallet at a time during installation, refer to NCMA TEK notes for Hot and Cold Weather construction practices. www.ncma.org

Lay units using the best concrete masonry practices. Lay blocks with faces level, plumb and true to the line strung horizontally at the finished face. Units shall have uniform, 3/8" wide joints both horizontally and vertically on the finished side of the wall. Tool joints neatly after they are thumb print hard. Make them straight and uniform. Size and place cut pieces appropriately to maintain consistency and bond. Complete masonry construction using procedures and workmanship consistent with the best masonry practices.

Installation
Lighting: Provide adequate lighting for masonry work by placing all lighting at a reasonable distance from the wall for even illumination. Do not use direct lighting.
Cutting: Make all unit cuts, including those for bonding, holes, and boxes, etc., with motor-driven masonry saws, using either an abrasive or diamond blade. Cut neatly and locate for best appearance.

Mortar Bedding and Jointing
1. Lay units with full mortar coverage on head and bed joints taking care not to block cores to be grouted or filled with masonry installation.
2. Tool and mortar joints when thumbprint hard into a concave configuration.
3. Care should be taken to remove mortar from the face of masonry units before it sets.
4. Tuckpoint the joints for proper appearance.

Flashing of Masonry Work
Install flashing at locations shown in the plans and in accordance with the best masonry flashing practices.

Weep Holes and Vents
Install weep holes and vents at proper intervals at courses above grade and at any water stops over windows, doors, and beams. INSPECTION The textured faces shall conform to the requirements of ASTM C90 when viewed from a distance of twenty (20) feet to the wall.

Cleaning
Keep walls daily during installation using brushes. Do not allow excess mortar to harden on the finished surface. Do not high-pressure wash. This may cause efflorescence.

Maintenance
When properly installed, Partanna CMU (Concrete Masonry Unit) need virtually no maintenance other than routine cleaning.

* Test reports are available upon request.

BETON™
CONSULTING ENGINEERS L.L.C.

Rebekkah Swisher
Partanna Global, Inc.

9/8/2023

Sent by email

RE: Tests of Concrete Masonry Units

Further to our ongoing discussion with Partanna Global, Beton Consulting Engineers, LLC (Beton) is pleased to present this factual report of concrete masonry unit testing. This letter is intended to show that the previous testing shows compliance with ASTM C90

Wingerter Laboratories, INC. performed compressive strength and absorption testing on samples of 2 different batches of concrete masonry units. One batch was Identified as 8 LP (from report 2) and 8 S (from report 3). From each batch, 4 samples were broken for compressive strength, and 1 sample used for absorption. The testing from Wingerter conforms to ASTM C140 and the samples conform to ASTM C90 & C129. ASTM E119 was not performed as the fire ratings were calculated from the absorption and equivalent thickness values. ASTM C1314 is yet to be performed, and is normally used to judge the quality of the actual construction, and not the materials incorporated into the work.

ASTM C1314 – Standard Test Method for Compressive Strength of Masonry Prisms

- This testing has not been performed. In the test Masonry Prisms are frabicated using the proposed block and mortar. The test is normally used to check field production of walls based on block that meet the project specifications. It is a test of the quality of construction. It is nearly certain that the Partanna materials would meet the requirements.

ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials

- While a complete fire test in accordance with ASTM C119 has not been performed, Fire ratings given from absorption by ASTM C140 tests have been presented. The fire rating of E119 is also, like the ASTM C1314, a test of the entire wall system. The use of conforming blocks in systems that have already been tested is often an acceptable substitute.

ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

- Masonry units conformed to ASTM C90 and ASTM C129
- Fire ratings given from ASTM C140 test reports are calculated from the absorption and web thickness of the units tested (Not from ASTM E119).
- Aggregates conformed to the requirements of ASTM C33.

The Table below presents a summary of the test results for the two types of materials tested as detailed above. They show compliance with the specified standards.

Sample ID	Total Load (lbs)	Gross Compressive Strength (psi)	Net Compressive Strength (psi)	Equivalent Thickness (in)	Fire Rating (hrs)	Absorption (%)
4 (8LP)	196400	1607	3294	3.8	1.75	8.9%
5 (8LP)	199570	1629	3347	3.8	1.75	
6 (8LP)	195580	1594	3280	3.8	1.75	
7 (8LP)	193250	1583	3241	3.8	1.75	
9 (8S)	207760	1696	3519	3.7	1.75	5.3%
10 (8S)	217910	1767	3691	3.8	1.75	
11 (8S)	220530	1802	3735	3.8	1.75	
12 (8S)	221460	1812	3751	3.7	1.75	

Table 1: Masonry Unit Testing Results.

We have calculated the Thermal resistance of the block based on the method found in ACI 122. The calculated values are as shown below:

R = 3.00 hr ft2 °F/Btu
U = 0.333 Btu/ (hr ft2 °F)

We trust this letter is self-explanatory. If you should have any questions, please feel free to contact the undersigned at 612-363-7111
Sincerely,

Beton Consulting Engineers

Kevin A. MacDonald, PhD, PE, FACI
President/Sr. Principal Engineer

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services
1820 NE 144th Street, North Miami, FL 33181
TELEPHONE: 305-944-3401 FACSIMILE: 305-949-8698

TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	3
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	[]
TESTED BY:			

Laboratory No.:	5243	5244	5245	5246
Sample No.:	9	10	11	12
Manufacturer's ID:	8 S	8 S	8 S	8 S
Date Made:	4/11/2023	4/11/2023	4/11/2023	4/11/2023
Date Tested:	7/19/2023	7/19/2023	7/19/2023	7/19/2023
Age (days):	99	99	99	99
Width (in):	7.78	7.83	7.83	7.82
Length (in):	15.75	15.75	15.63	15.63
Height (in):	7.96	7.96	7.90	8.01
Shell Thickness (in):	1.31	1.29	1.27	1.27
Web Thickness (in):				
Area of Sample (sq. in.)				
Gross:	122.5	123.3	122.4	122.2
Net:	59.0	59.0	59.0	59.0
Compression Test				
Total Load (lbs.):	207,760	217,910	220,530	221,460
Compressive Strength (psi):				
Gross:	1,696	1,767	1,802	1,812
Net:	3,519	3,691	3,735	3,751
Absorption Test				
Weight (lbs):				
As Received:				
Dry:				
Wet:				
Suspended:				
Moisture Content (%):				
Absorption (%):				
Absorption (pcf):				
Density (pcf):				
Fire Rating				
Equivalent Thickness (in.):	3.7	3.8	3.8	3.7
Fire Rating per FBC (hrs.):	1.75	1.75	1.75	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

Continued on next page

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services

1820 NE 144th Street, North Miami, FL 33181

TELEPHONE: 305-944-3401 FACSIMILE: 305-949-8698

TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	3
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	
TESTED BY:			

Laboratory No.:	5247
Sample No.:	13
Manufacturer's ID:	8 S
Date Made:	4/11/2023
Date Tested:	
Age (days):	
Width (in):	7.82
Length (in):	15.75
Height (in):	8.02
Shell Thickness (in):	
Web Thickness (in):	
Area of Sample (sq. in.)	
Gross:	123.2
Net:	59.0

Compression Test

Total Load (lbs.):	
Compressive Strength (psi):	
Gross:	
Net:	

Absorption Test

Weight (lbs):	
As Received:	38.90
Dry:	37.50
Wet:	39.50
Suspended:	22.40
Moisture Content (%):	70.0
Absorption (%):	5.3
Absorption (pcf):	7.3
Density (pcf):	136.8

Fire Rating

Equivalent Thickness (in.):	3.7
Fire Rating per FBC (hrs.):	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully submitted,

WINGERTER LABORATORIES, INC.

7/21/23

Donald J. Flood, Jr., P.E.

Florida License No. 44847

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services

1820 NE 144th Street, North Miami, FL 33181

TELEPHONE: 305-944-3401 FACSIMILE: 305-949-8698

TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	3
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	[illegible]
TESTED BY:			

Laboratory No.:	5243	5244	5245	5246
Sample No.:	9	10	11	12
Manufacturer's ID:	8 S	8 S	8 S	8 S
Date Made:	4/11/2023	4/11/2023	4/11/2023	4/11/2023
Date Tested:	7/19/2023	7/19/2023	7/19/2023	7/19/2023
Age (days):	99	99	99	99
Width (in):	7.78	7.83	7.83	7.82
Length (in):	15.75	15.75	15.63	15.63
Height (in):	7.96	7.96	7.90	8.01
Shell Thickness (in):	1.31	1.29	1.27	1.27
Web Thickness (in):				
Area of Sample (sq. in.)				
Gross:	122.5	123.3	122.4	122.2
Net:	59.0	59.0	59.0	59.0
Compression Test				
Total Load (lbs.):	207,760	217,910	220,530	221,460
Compressive Strength (psi):				
Gross:	1,696	1,767	1,802	1,812
Net:	3,519	3,691	3,735	3,751
Absorption Test				
Weight (lbs):				
As Received:				
Dry:				
Wet:				
Suspended:				
Moisture Content (%):				
Absorption (%):				
Absorption (pcf):				
Density (pcf):				
Fire Rating				
Equivalent Thickness (in.):	3.7	3.8	3.8	3.7
Fire Rating per FBC (hrs.):	1.75	1.75	1.75	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

Continued on next page

WINGERTER LABORATORIES, INC.

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TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	3
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	
TESTED BY:			

Laboratory No.:	5247
Sample No.:	13
Manufacturer's ID:	8 S
Date Made:	4/11/2023
Date Tested:	
Age (days):	
Width (in):	7.82
Length (in):	15.75
Height (in):	8.02
Shell Thickness (in):	
Web Thickness (in):	
Area of Sample (sq. in.)	
Gross:	123.2
Net:	59.0

Compression Test

Total Load (lbs.):	
Compressive Strength (psi):	
Gross:	
Net:	

Absorption Test

Weight (lbs):	
As Received:	38.90
Dry:	37.50
Wet:	39.50
Suspended:	22.40
Moisture Content (%):	70.0
Absorption (%):	5.3
Absorption (pcf):	7.3
Density (pcf):	136.8

Fire Rating

Equivalent Thickness (in.):	3.7
Fire Rating per FBC (hrs.):	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully submitted,
WINGERTER LABORATORIES, INC.

7/21/23

Donald J. Flood, Jr., P.E.
Florida License No. 44847

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services
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TELEPHONE: 305-944-3401 FACSIMILE: 305-949-8698

TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	2
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	ASTM C-140
TESTED BY:			

Laboratory No.:	5078	5079	5080	5081
Sample No.:	4	5	6	7
Manufacturer's ID:	8 LP	8 LP	8 LP	8 LP
Date Made:	4/11/2023	4/11/2023	4/11/2023	4/11/2023
Date Tested:	7/19/2023	7/19/2023	7/19/2023	7/19/2023
Age (days):	99	99	99	99
Width (in):	7.82	7.84	7.85	7.81
Length (in):	15.63	15.63	15.63	15.63
Height (in):	7.94	8.05	8.03	7.85
Shell Thickness (in):	1.23	1.25	1.25	1.25
Web Thickness (in):				
Area of Sample (sq. in.)				
Gross:	122.2	122.5	122.7	122.1
Net:	59.6	59.6	59.6	59.6
Compression Test				
Total Load (lbs.):	196,400	199,570	195,580	193,250
Compressive Strength (psi):				
Gross:	1,607	1,629	1,594	1,583
Net:	3,294	3,347	3,280	3,241
Absorption Test				
Weight (lbs):				
As Received:				
Dry:				
Wet:				
Suspended:				
Moisture Content (%):				
Absorption (%):				
Absorption (pcf):				
Density (pcf):				
Fire Rating				
Equivalent Thickness (in.):	3.8	3.8	3.8	3.8
Fire Rating per FBC (hrs.):	1.75	1.75	1.75	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

Continued on next page

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services
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TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	2
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	ASTM C-140
TESTED BY:			

Laboratory No.:	5082
Sample No.:	8
Manufacturer's ID:	8 LP
Date Made:	4/11/2023
Date Tested:	
Age (days):	
Width (in):	7.86
Length (in):	15.75
Height (in):	8.08
Shell Thickness (in):	
Web Thickness (in):	
Area of Sample (sq. in.)	
Gross:	123.8
Net:	59.6

Compression Test

Total Load (lbs.):	
Compressive Strength (psi):	
Gross:	
Net:	

Absorption Test

Weight (lbs):	
As Received:	27.80
Dry:	26.90
Wet:	29.30
Suspended:	11.90
Moisture Content (%):	37.5
Absorption (%):	8.9
Absorption (pcf):	8.6
Density (pcf):	96.5

Fire Rating

Equivalent Thickness (in.):	3.8
Fire Rating per FBC (hrs.):	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully submitted,
WINGERTER LABORATORIES, INC.

7/24/23
Donald J. Flood, Jr., P.E.
Florida License No. 44847

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services
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TELEPHONE: 305-944-3401 FACSIMILE: 305-949-8698

TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	2
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	ASTM C-140
TESTED BY:			

Laboratory No.:	5078	5079	5080	5081
Sample No.:	4	5	6	7
Manufacturer's ID:	8 LP	8 LP	8 LP	8 LP
Date Made:	4/11/2023	4/11/2023	4/11/2023	4/11/2023
Date Tested:	7/19/2023	7/19/2023	7/19/2023	7/19/2023
Age (days):	99	99	99	99
Width (in):	7.82	7.84	7.85	7.81
Length (in):	15.63	15.63	15.63	15.63
Height (in):	7.94	8.05	8.03	7.85
Shell Thickness (in):	1.23	1.25	1.25	1.25
Web Thickness (in):				
Area of Sample (sq. in.)				
Gross:	122.2	122.5	122.7	122.1
Net:	59.6	59.6	59.6	59.6
Compression Test				
Total Load (lbs.):	196,400	199,570	195,580	193,250
Compressive Strength (psi):				
Gross:	1,607	1,629	1,594	1,583
Net:	3,294	3,347	3,280	3,241
Absorption Test				
Weight (lbs):				
As Received:				
Dry:				
Wet:				
Suspended:				
Moisture Content (%):				
Absorption (%):				
Absorption (pcf):				
Density (pcf):				
Fire Rating				
Equivalent Thickness (in.):	3.8	3.8	3.8	3.8
Fire Rating per FBC (hrs.):	1.75	1.75	1.75	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

Continued on next page

WINGERTER LABORATORIES, INC.

Engineering Testing Inspection Services
1820 NE 144th Street, North Miami, FL 33181
TELEPHONE: 305-944-3401 FACSIMILE: 305-949-8698

TEST OF CONCRETE MASONRY UNITS

CLIENT:	Partanna Global, Inc.	**REPORT NO:**	2
PROJECT:	Quality Control 2023	**ORDER NO.:**	23-1197
DATE DELIVERED:	7/12/2023	**DELIVERED BY:**	Client
LOCATION:	WLI Testing Facitlity	**P.O. NO.:**	
CMU SPECIFICATION:	ASTM C-140	**PERMIT NO.:**	ASTM C-140
TESTED BY:			

Laboratory No.:	5082
Sample No.:	8
Manufacturer's ID:	8 LP
Date Made:	4/11/2023
Date Tested:	
Age (days):	
Width (in):	7.86
Length (in):	15.75
Height (in):	8.08
Shell Thickness (in):	
Web Thickness (in):	
Area of Sample (sq. in.)	
Gross:	123.8
Net:	59.6

Compression Test

Total Load (lbs.):	
Compressive Strength (psi):	
Gross:	
Net:	

Absorption Test

Weight (lbs):	
As Received:	27.80
Dry:	26.90
Wet:	29.30
Suspended:	11.90
Moisture Content (%):	37.5
Absorption (%):	8.9
Absorption (pcf):	8.6
Density (pcf):	96.5

Fire Rating

Equivalent Thickness (in.):	3.8
Fire Rating per FBC (hrs.):	1.75

Remarks Fire Rating for Limestone, Cinders, or Unexpanded Slag Only.

DONALD J. FLOOD LICENSE No 44847 STATE OF FLORIDA PROFESSIONAL ENGINEER

Respectfully submitted,
WINGERTER LABORATORIES, INC.

7/21/23

Donald J. Flood, Jr., P.E.
Florida License No. 44847

GREENGUARD CERTIFICATION TEST REPORT

Customer Information	PARTANNA GLOBAL JESSICA NORDLING 16030 VENTURA BLVD SUITE 240 ENCINO CA 91436				
Product Description	Flooring-Building Product				
Test Group	Solid Surfaces - 01				
Category	Surfacing Materials				
Test Type	Certification	Year 2			
Test Method	UL 2821 "GREENGUARD Certification Program Method for Measuring and Evaluating Chemical Emissions From Building Materials, Finishes and Furnishings Using Dynamic Environmental Chambers" 2022.				

	Environment	TVOC	Formaldehyde	Total Aldehydes	CREL/TLV
GREENGUARD	Office	✓	✓	✓	✓
GREENGUARD Gold	Office	✓	✓	✓	✓
	Classroom	✓	✓	✓	✓

✓ - meets criteria; X - over criteria

Authorized by

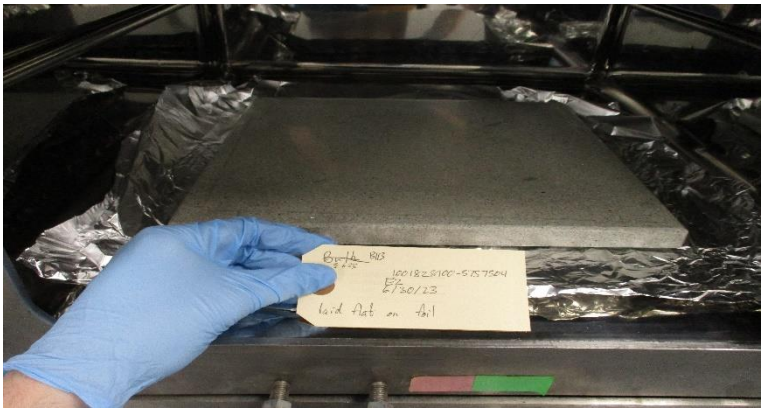
Allyson M. McFry
Chemistry Laboratory Director

MODELING FOR PREDICTED AIR CONCENTRATION

Certification Program	Environment Basis	Modeling Basis	Surface Area (m^2)	Room Volume (m^3)	ACH (1/hr)
GREENGUARD and GREENGUARD Gold Office	CDPH/EHLB/Standard Method	floor	33.4	30.6	0.68
GREENGUARD Gold Classroom	CDPH/EHLB/Standard Method	floor	94.6	231	0.82

Note that certain environments and/or modeling scenarios may prevent assessment of low level CREL and TLV analytes due to the emissions being below the lower LOQ (0.04 µg). For example, benzene ½ CREL is 1.5 µg/m^3.

PHOTOGRAPH OF SAMPLE



GREENGUARD RESULTS SUMMARY

Product Description	Flooring-Building Product		
GREENGUARD Acceptable IAQ Criteria		**168 Hour Product Measurement**	**Product Compliance for IAQ**
TVOC[a]	≤ 0.5 mg/m³	0.006 mg/m³	Yes
Formaldehyde	≤ 0.05 ppm	< 0.002 ppm	Yes
Total Aldehydes[b]	≤ 0.10 ppm	< 0.002 ppm	Yes
4-Phenylcyclohexene	≤ 0.0065 mg/m³	< 0.003 mg/m³	Yes
Individual VOCs	all ≤ 1/10 TLV	----------[c]	Yes

[a] "TVOC" is the sum of all VOCs measured via TD/GC/MS which elute between n-hexane (C_6) and n-hexadecane (C_{16}) quantified using calibration to a toluene surrogate.

[b] "Total Aldehydes" is the sum of all measured normal aldehydes from formaldehyde to nonanal, plus benzaldehyde. Heptanal through nonanal are analyzed using TD/GC/MS. The remaining aldehydes are analyzed using HPL/UV methodology. All aldehydes are quantified to authentic standards.

[c] All individual VOCs detected met the criteria of less than 1/10 the ACGIH established threshold limit values (TLVs).

PROJECT DESCRIPTION

This study was conducted using a UL Environment's GREENGUARD test method following the requirements of GREENGUARD Certification program. The product was monitored for emissions of total volatile organic compounds (TVOC), formaldehyde, target list aldehydes, and other individual volatile organic compounds (VOCs) over a 168-hour exposure period. These emissions were measured, and the resultant air concentrations were determined for each of the potential pollutants. Determination of compliance is based on predicted air concentrations modeled using the GREENGUARD program room loading.

Report Outline:

Download more information regarding UL's technical references and resources, product evaluation methodologies information, quality control program, and environmental chamber evaluations from our website click here or https://www.ul.com/offerings/greenguard-certification

For RSD, Quality Assurance Report or other quality documents, Request here or contact ULE.

TABLE 1

ENVIRONMENTAL CHAMBER STUDY PARAMETERS			
Product Description	Flooring-Building Product		
Product Manufacture Date	Not Provided		
Product Collection Date	Not Provided		
Product Shipping Date	June 16, 2023		
Date Received	June 19, 2023		
Test Description	The product was received by UL Environment as packaged and shipped by the customer. The package was visually inspected and stored in a controlled environment immediately following sample check-in. Just prior to loading, the product was unpackaged and prepared for the required loading to expose the finished surfaces only. The sample was placed inside the environmental chamber and tested according to the specified protocol.		
Test Period	June 23, 2023 – June 30, 2023		
Area	one-sided area = 0.1024 m^2		
Environmental Chamber ID and Volume	SE2 - 0.0868 m^3		
Product Loading	1.18 m^2/m^3		
Test Conditions	1.00 ± 0.05 ACH 50% RH ± 5% RH 22.6ºC - 24.5ºC		
***Accredited Laboratory Locations**	**Testing Laboratory**	**Analytical Laboratory**	**Technical Reporting Location**
	ULE - Marietta	ULE - Marietta	ULE - Marietta

**Unable to confirm product meets all GREENGUARD sampling requirements. Date(s) not provided on the Chain of Custody.

The temperature range specification is 23°C ± 1°. The actual temperature range listed above may vary slightly. If the range is outside this specification, data was reviewed to ensure a negative impact did not occur.

*Accredited Laboratory Locations	
Location	**Address**
ULE - Marietta	UL Environment 2211 Newmarket Parkway, Marietta, GA 30067-9399 USA
ULE - Guangzhou	UL Verification Services (Guangzhou) 1-3F & Room 501, Building 2 (R&D Center A1), No. 25, South Huanshi Avenue, Nansha District, Guangzhou 511458, China
ULE - Cabiate	UL International Italia S.r.l ATTN: IAQ Laboratory Via Europa, 9, I – 22060 – Cabiate (Como), Italia
ULE - Vietnam	UL VS (VIET NAM) CO. LTD., Lot C5, Conurbation 2, Street K1, Cat Lai Industrial Zone, Thanh My Loi Ward, District 2, Ho Chi Minh City, Vietnam
UL - Shimadzu	Shimadzu Techno-Research, Inc. 1, Nishinokyo-Shimoaicho Nakagyo-ku, Kyoto 604-8436 Japan
KCL	Korea Conformity Laboratories #805, I-Valley, 149 Gongdan-ro Gunpo-si, Gyeonggi-do, 15849 Korea
Normec	Normec Product Testing N.V. Honderdweg 13, 9320 Wetteren Belgium

This test is accredited and meets the requirements of ISO/IEC 17025 as verified by ANSI National Accreditation Board. Refer to certificate and scope of accreditation AT-1297.

TABLE 2

Product Description	Flooring-Building Product		
TVOC CHAMBER CONCENTRATIONS, EMISSION FACTORS AND PREDICTED AIR CONCENTRATIONS			
Elapsed Exposure Hour*	**Chamber Concentration µg/m³**	**Emission Factor µg/m²•hr**	**Predicted Air Concentration** µg/m³**
0 (Background)	BQL	BQL	---
6	83.5	70.8	114
24	18.3	15.4	25
48	9.8	8.4	14
72			
96	7.6	6.4	9
168	3.3	2.8	6
Power Law Decay Constant = k_T = 0.764			

FORMALDEHYDE CHAMBER CONCENTRATIONS, EMISSION FACTORS AND PREDICTED AIR CONCENTRATIONS				
Elapsed Exposure Hour*	**Chamber Concentration µg/m³**	**Emission Factor µg/m²•hr**	**Predicted Air Concentration****	
			µg/m³	**ppm**
0 (Background)	BQL	BQL	---	---
6	BQL	BQL	< 3	< 0.002
24	BQL	BQL	< 3	< 0.002
48	BQL	BQL	< 3	< 0.002
72	BQL	BQL	< 3	< 0.002
96	BQL	BQL	< 3	< 0.002
168	BQL	BQL	< 3	< 0.002

TARGET LIST ALDEHYDES CHAMBER CONCENTRATIONS, EMISSION FACTORS AND PREDICTED AIR CONCENTRATIONS				
Elapsed Exposure Hour*	**Chamber Concentration µg/m³**	**Emission Factor µg/m²•hr**	**Predicted Air Concentration****	
			µg/m³	**ppm**
0 (Background)	BQL	BQL	---	---
6	BQL	BQL	< 3	< 0.002
24	BQL	BQL	< 3	< 0.002
48	BQL	BQL	< 3	< 0.002
72	BQL	BQL	< 3	< 0.002
96	BQL	BQL	< 3	< 0.002
168	BQL	BQL	< 3	< 0.002

*Exposure hours are nominal (± 1 hour).

BQL = Below quantifiable level of 0.04 µg based on a standard 18 L air collection volume for VOCs and 0.1 µg based on a standard 45 L air collection volume for aldehydes.

**Predicted Air Concentrations are based on GREENGUARD modeling predicted concentration parameters. For more information click here.

72 hour samples were lost due to instrument malfunction.

TABLE 3

Product Description	Flooring-Building Product						
CHAMBER CONCENTRATIONS OF IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS							
CAS Number	**Compound**	**Elapsed Exposure Hour (µg/m³)**						
		0 (BG)	**6**	**24**	**48**	**72**	**96**	**168**
71-36-3	1-Butanol (N-Butyl alcohol)†	BQL	34.5	18.6	14.9		11.6	6.8
104-76-7	1-Hexanol, 2-ethyl†	BQL	6.6	4.3	3.8		2.9	2.2
124-18-5	Decane	BQL	5.6	2.1				
17312-73-1	Undecane, 5,5-dimethyl*	BQL	5.5	2.1				
1632-70-8	Undecane, 5-methyl*	BQL	5.5	2.2				
13150-81-7	Decane, 2,6-dimethyl	BQL	4.5					
1636-41-5	Octane, 4,5-diethyl-*	BQL	4.5					
111-65-9	Octane	BQL	4.0					
112-40-3	Dodecane†	BQL	3.7					
142-96-1	n-Butyl ether	BQL	3.8					
17312-50-4	Decane, 2,5-dimethyl*	BQL	3.2					
17301-23-4	Undecane, 2,6-dimethyl	BQL	3.3					
2980-69-0	Undecane, 4-methyl	BQL	3.0					
541-02-6	Cyclopentasiloxane, decamethyl	BQL	2.9					
998-35-6	Nonane, 5-propyl*	BQL	2.9					
127-18-4	Ethene, 1,1,2,2-tetrachloro (Tetrachloroethylene)†	BQL	2.7					
5911-04-6	Nonane, 3-methyl	BQL	2.6					
1002-43-3	Undecane, 3-methyl	BQL	2.5					
31081-17-1	Nonane, 2-methyl-5-propyl*	BQL	2.3					
17302-36-2	5-Ethyldecane*	BQL	2.2					

*Indicates NIST/EPA/NIH best library match only based on retention time and mass spectral characteristics.

†Denotes quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.

Quantifiable level is 0.04 µg based on a standard 18 L air collection volume.

72 hour samples were lost due to instrument malfunction.

TABLE 4

Product Description	Flooring-Building Product						
EMISSION FACTORS OF IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS							
CAS Number	**Compound**	**Elapsed Exposure Hour (µg/m²•hr)**					
		6	**24**	**48**	**72**	**96**	**168**
71-36-3	1-Butanol (N-Butyl alcohol)†	29.2	15.7	12.7		9.9	5.8
104-76-7	1-Hexanol, 2-ethyl†	5.6	3.6	3.2		2.4	1.8
124-18-5	Decane	4.7	1.8				
17312-73-1	Undecane, 5,5-dimethyl*	4.7	1.7				
1632-70-8	Undecane, 5-methyl*	4.7	1.9				
13150-81-7	Decane, 2,6-dimethyl	3.8					
1636-41-5	Octane, 4,5-diethyl-*	3.8					
111-65-9	Octane	3.4					
112-40-3	Dodecane†	3.2					
142-96-1	n-Butyl ether	3.2					
17312-50-4	Decane, 2,5-dimethyl*	2.8					
17301-23-4	Undecane, 2,6-dimethyl	2.8					
2980-69-0	Undecane, 4-methyl	2.5					
541-02-6	Cyclopentasiloxane, decamethyl	2.4					
998-35-6	Nonane, 5-propyl*	2.4					
127-18-4	Ethene, 1,1,2,2-tetrachloro (Tetrachloroethylene)†	2.3					
5911-04-6	Nonane, 3-methyl	2.2					
1002-43-3	Undecane, 3-methyl	2.1					
31081-17-1	Nonane, 2-methyl-5-propyl*	2.0					
17302-36-2	5-Ethyldecane*	1.9					

*Indicates NIST/EPA/NIH best library match only based on retention time and mass spectral characteristics.

†Denotes quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.

Quantifiable level is 0.04 µg based on a standard 18 L air collection volume.

72 hour samples were lost due to instrument malfunction.

TABLE 5

Product Description	Flooring-Building Product						
CHAMBER CONCENTRATIONS OF TARGET LIST ALDEHYDES							
CAS Number	**Compound**	**Elapsed Exposure Hour (µg/m³)**						
		0 (BG)	**6**	**24**	**48**	**72**	**96**	**168**
4170-30-3	2-Butenal	BQL						
75-07-0	Acetaldehyde	BQL						
100-52-7	Benzaldehyde	BQL						
5779-94-2	Benzaldehyde, 2,5-dimethyl	BQL						
529-20-4	Benzaldehyde, 2-methyl	BQL						
620-23-5/ 104-87-0	Benzaldehyde, 3- and/or 4-methyl	BQL						
123-72-8	Butanal	BQL						
590-86-3	Butanal, 3-methyl	BQL						
50-00-0	Formaldehyde	BQL						
66-25-1	Hexanal	BQL						
110-62-3	Pentanal	BQL						
123-38-6	Propanal	BQL						

TABLE 6

Product Description	Flooring-Building Product						
EMISSION FACTORS OF TARGET LIST ALDEHYDES							
CAS Number	**Compound**	**Elapsed Exposure Hour (µg/m²•hr)**					
		6	**24**	**48**	**72**	**96**	**168**
4170-30-3	2-Butenal						
75-07-0	Acetaldehyde						
100-52-7	Benzaldehyde						
5779-94-2	Benzaldehyde, 2,5-dimethyl						
529-20-4	Benzaldehyde, 2-methyl						
620-23-5/ 104-87-0	Benzaldehyde, 3- and/or 4-methyl						
123-72-8	Butanal						
590-86-3	Butanal, 3-methyl						
50-00-0	Formaldehyde						
66-25-1	Hexanal						
110-62-3	Pentanal						
123-38-6	Propanal						

Quantifiable level is 0.1 µg is based on a standard 45 L air collection volume.

TABLE 7

SUPPLEMENTAL EMISSIONS INFORMATION

The table below represents this product's identified chemical emissions found on certain regulatory lists. This list only provides a statement regarding possible health effects associated with this compound and not the relative risks of exposure. Proper interpretation of the risks associated with exposure to a given regulated compound requires a more detailed evaluation of toxicological activity. Certain purchasing programs may require this information be submitted.

Product Description	Flooring-Building Product						
CAS Number	**Compound**	**✓() = FOUND IN LISTING (CLASS)**					
		CAL PROP. 65	**NTP**	**IARC**	**CAL AIR TOXICS**	**CREL**	**TLV**
71-36-3	1-Butanol (N-Butyl alcohol)†				✓(IVB)		✓
104-76-7	1-Hexanol, 2-ethyl†						✓
127-18-4	Ethene, 1,1,2,2-tetrachloro (Tetrachloroethylene)†	✓(1)	✓(2B 2B)	✓(2A)	✓(I)	✓	✓
111-65-9	Octane						✓

†Denotes quantified using multipoint authentic standard curve

CAL Prop. 65: California Health and Welfare Agency, Proposition 65 Chemicals
1 = known to cause cancer
2 = known to cause reproductive toxicity

NTP: National Toxicology Program
2A = known to be carcinogenic to humans
2B = reasonably anticipated to be carcinogenic to humans

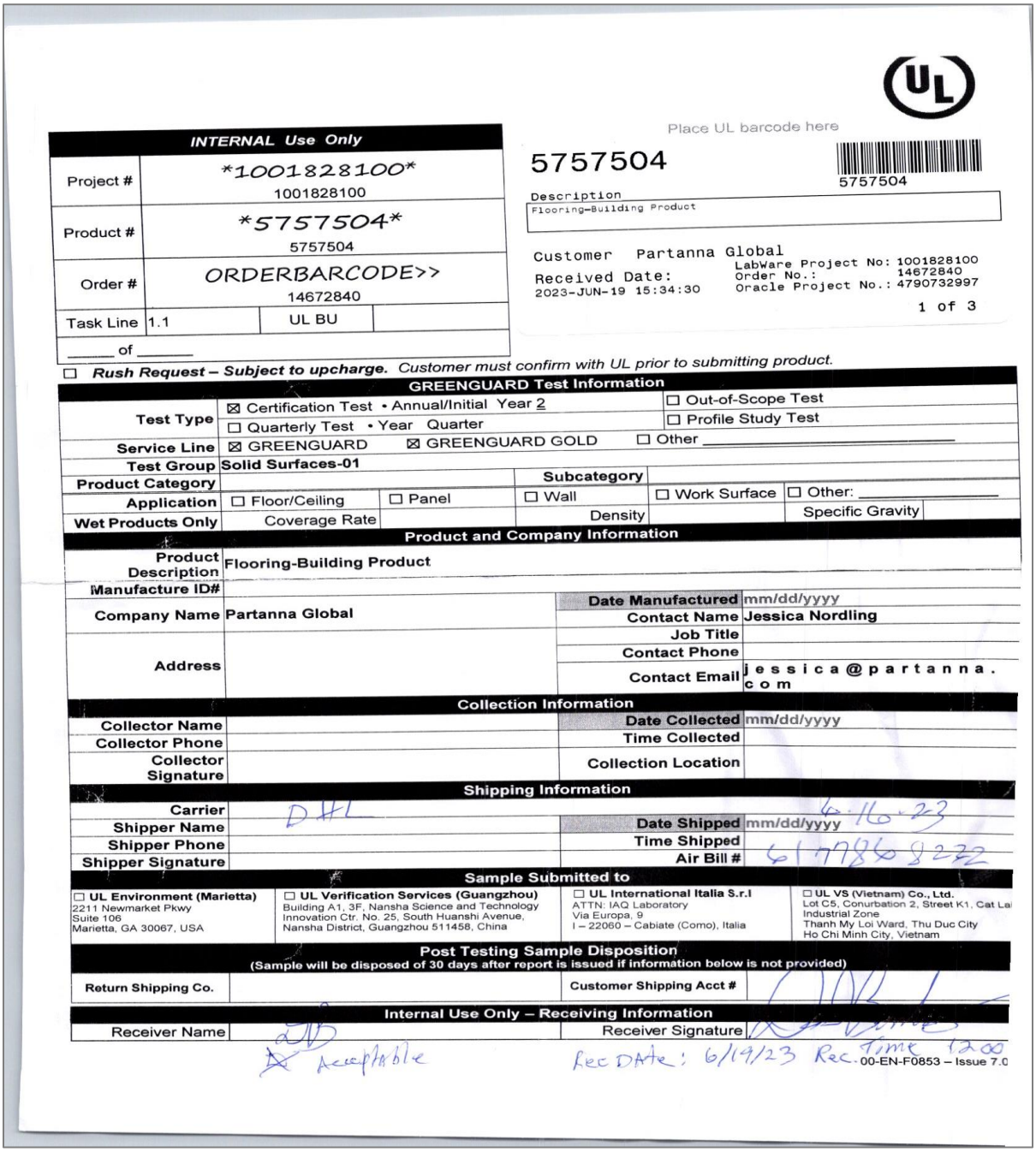
IARC: International Agency on Research of Cancer
1 = carcinogenic to humans
2A = probably carcinogenic to humans
2B = possibly carcinogenic to humans
3 = unclassifiable as to carcinogenicity to humans
4 = probably not carcinogenic to humans

California Air Toxics
I = Substances identified as Toxic Air Contaminants, known to be emitted in California, with a full set of health values reviewed by the Scientific Review Panel.
IIA = Substances identified as Toxic Air Contaminants, known to be emitted in California, with one or more health values under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
IIB= Substances NOT identified as Toxic Air Contaminants, known to be emitted in California, with one or more health values under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
III = Substances known to be emitted in California and are NOMINATED for development of health values or additional health values.
IVA = Substance identified as Toxic Air Contaminants, known to be emitted in California and are TO BE EVALUATED for entry into Category III.
IVBA =Substance NOT identified as Toxic Air Contaminants, known to be emitted in California and are TO BE EVALUATED for entry into Category III.
V = Substance identified as Toxic Air Contaminants, and NOT KNOWN TO BE EMITTED from stationary source facilities in California based on information from the AB 2588 Air Toxic "Hot Spots" Program and the California Toxic Release Inventory.
VI = Substances identified as Toxic Air Contaminants, NOT KNOWN TO BE EMITTED from stationary source facilities in California, and are active ingredients in pesticides in California.

CREL: California Office of Environmental Health's Hazard Assessment (OEHHA), Chronic Reference Exposure Levels. The GREENGUARD program does not include all Chronic Reference Exposure Levels (CRELs) adopted by the State of California Office of Environmental Health Hazard Assessment (OEHHA). For example, caprolactam and 2-butoxyethanol.
✓ = Found in Listing

ACGIH TLV American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents.
✓ = Found in Listing.

CHAIN OF CUSTODY



INTERNAL Use Only

Project #	*1001828100* 1001828100		
Product #	*5757504* 5757504		
Order #	ORDERBARCODE>> 14672840		
Task Line	1.1	UL BU	
_____ of _____			

Place UL barcode here

5757504

5757504

Description: Flooring-Building Product

Customer Partanna Global
Received Date: 2023-JUN-19 15:34:30
LabWare Project No: 1001828100
Order No.: 14672840
Oracle Project No.: 4790732997

1 of 3

☐ *Rush Request – Subject to upcharge.* *Customer must confirm with UL prior to submitting product.*

GREENGUARD Test Information

Test Type	☒ Certification Test • Annual/Initial Year 2			☐ Out-of-Scope Test	
	☐ Quarterly Test • Year Quarter			☐ Profile Study Test	
Service Line	☒ GREENGUARD ☒ GREENGUARD GOLD ☐ Other _____				
Test Group	Solid Surfaces-01				
Product Category			Subcategory		
Application	☐ Floor/Ceiling	☐ Panel	☐ Wall	☐ Work Surface	☐ Other: _____
Wet Products Only	Coverage Rate		Density		Specific Gravity

Product and Company Information

Product Description	Flooring-Building Product		
Manufacture ID#		Date Manufactured	mm/dd/yyyy
Company Name	Partanna Global	Contact Name	Jessica Nordling
		Job Title	
Address		Contact Phone	
		Contact Email	jessica@partanna.com

Collection Information

Collector Name		Date Collected	mm/dd/yyyy
Collector Phone		Time Collected	
Collector Signature		Collection Location	

Shipping Information

Carrier	DHL	Date Shipped	mm/dd/yyyy 6-16-23
Shipper Name		Time Shipped	
Shipper Phone		Air Bill #	6179860222
Shipper Signature			

Sample Submitted to

☐ UL Environment (Marietta) 2211 Newmarket Pkwy Suite 106 Marietta, GA 30067, USA	☐ UL Verification Services (Guangzhou) Building A1, 3F, Nansha Science and Technology Innovation Ctr. No. 25, South Huanshi Avenue, Nansha District, Guangzhou 511458, China	☐ UL International Italia S.r.l ATTN: IAQ Laboratory Via Europa, 9 I – 22060 – Cabiate (Como), Italia	☐ UL VS (Vietnam) Co., Ltd. Lot C5, Conurbation 2, Street K1, Cat Lai Industrial Zone Thanh My Loi Ward, Thu Duc City Ho Chi Minh City, Vietnam

Post Testing Sample Disposition
(Sample will be disposed of 30 days after report is issued if information below is not provided)

Return Shipping Co.		Customer Shipping Acct #	

Internal Use Only – Receiving Information

Receiver Name		Receiver Signature	

Acceptable

Rec Date: 6/19/23 Rec. Time 1200

00-EN-F0853 – Issue 7.0

APPENDIX 1

GREENGUARD GOLD RESULTS SUMMARY

Product Description	Flooring-Building Product			
COMPLIANCE WITH GREENGUARD GOLD STANDARD				
GREENGUARD Gold Acceptable IAQ Criteria		**168 Hour Predicted Concentration****		**Product Compliance for IAQ**
		Office	**Classroom**	
TVOC	**≤ 0.22 mg/m³**	0.004 mg/m³	0.001 mg/m³	Yes
Formaldehyde	**≤ 0.0073 ppm**	< 0.002 ppm	< 0.001 ppm	Yes
Total Aldehydes	**≤ 0.043 ppm**	< 0.002 ppm	< 0.001 ppm	Yes
1-Methyl-2-Pyrrolidinone	**≤ 0.16 mg/m³**	< 0.003 mg/m³	< 0.001 mg/m³	Yes
Individual VOCs	**≤ 1/100 TLV and ≤ ½ chronic REL**	See Below		

**Predicted Air Concentrations are based on GREENGUARD Gold modeling predicted concentration parameters.

TOP TEN MOST ABUNDANT IDENTIFIED VOCS, INCLUDING ALDEHYDES					
CAS Number	**Compound**	**168 Hour Chamber Concentration (µg/m³)**	**168 Hour Emission Factor (µg/m²•hr)**	**Predicted Air Concentration** (µg/m³)**	
				Office	**Classroom**
71-36-3	1-Butanol (N-Butyl alcohol)†	6.8	5.8	9	3
104-76-7	1-Hexanol, 2-ethyl†	2.2	1.8	3	1

[a]American Conference of Governmental Industrial Hygienists. Threshold Limit Values for Chemical Substances and Physical Agents. Cincinnati, OH.

[b]Chronic Reference Exposure Levels (CRELs) adopted by the State of California Office of Environmental Health Hazard Assessment (OEHHA). Note that Gold assessment is only for the CDPH Table 4-1 CRELs, but other CRELS are included for informational purposes only. Also, not all OEHHA CRELs are pulled into this assessment. For example, caprolactam and 2-butoxyethanol are not included.

†Denotes quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.

‡Indicates compound identified and quantified by DNPH derivitization and HPLC/UV analysis with multipoint authentic standard.

*Identification based on NIST mass spectral database only.

**Predicted Air Concentrations are based on modeling predicted concentration parameters shown above.

CHEMICALS OF CONCERN WITH EXISTING TLV, CREL, CA PROP 65 OR CAL TOXIC AIR CONTAMINANT VALUES									
CAS Number	Compound	168 Hour Chamber Concentration (µg/m³)	168 Hour Emission Factor (µg/m²•hr)	168 Hour Predicted Concentration** (µg/m³)		✓ INDICATES PRESENCE ON LIST			
				Office	Classroom	CA PROP 65	CA TAC	CA CREL[b]	ACGIH TLV
71-36-3	1-Butanol (N-Butyl alcohol)†	6.8	5.8	9	3		✓(IVB)		✓
104-76-7	1-Hexanol, 2-ethyl†	2.2	1.8	3	1				✓

COMPARISON OF COMPOUNDS FOUND WITH EXISTING TLV AND/OR CHRONIC REL						
CAS Number	Compound	1/100 TLV[a] (µg/m³)	½ CA Chronic REL[b] (µg/m³)	168 Hour Predicted Concentration** (µg/m³)		Product Compliance
				Office	Classroom	
71-36-3	1-Butanol (N-Butyl alcohol)	610	---	9	3	Yes
104-76-7	1-Hexanol, 2-ethyl	270	---	3	1	Yes

[a]American Conference of Governmental Industrial Hygienists. Threshold Limit Values for Chemical Substances and Physical Agents. Cincinnati, OH.

[b]Chronic Reference Exposure Levels (CRELs) adopted by the State of California Office of Environmental Health Hazard Assessment (OEHHA). Note that Gold assessment is only for the CDPH Table 4-1 CRELs, but other CRELS are included for informational purposes only. Also, not all OEHHA CRELs are pulled into this assessment. For example, caprolactam and 2-butoxyethanol are not included.

†Denotes quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.

‡Indicates compound identified and quantified by DNPH derivitization and HPLC/UV analysis with multipoint authentic standard.

*Identification based on NIST mass spectral database only.

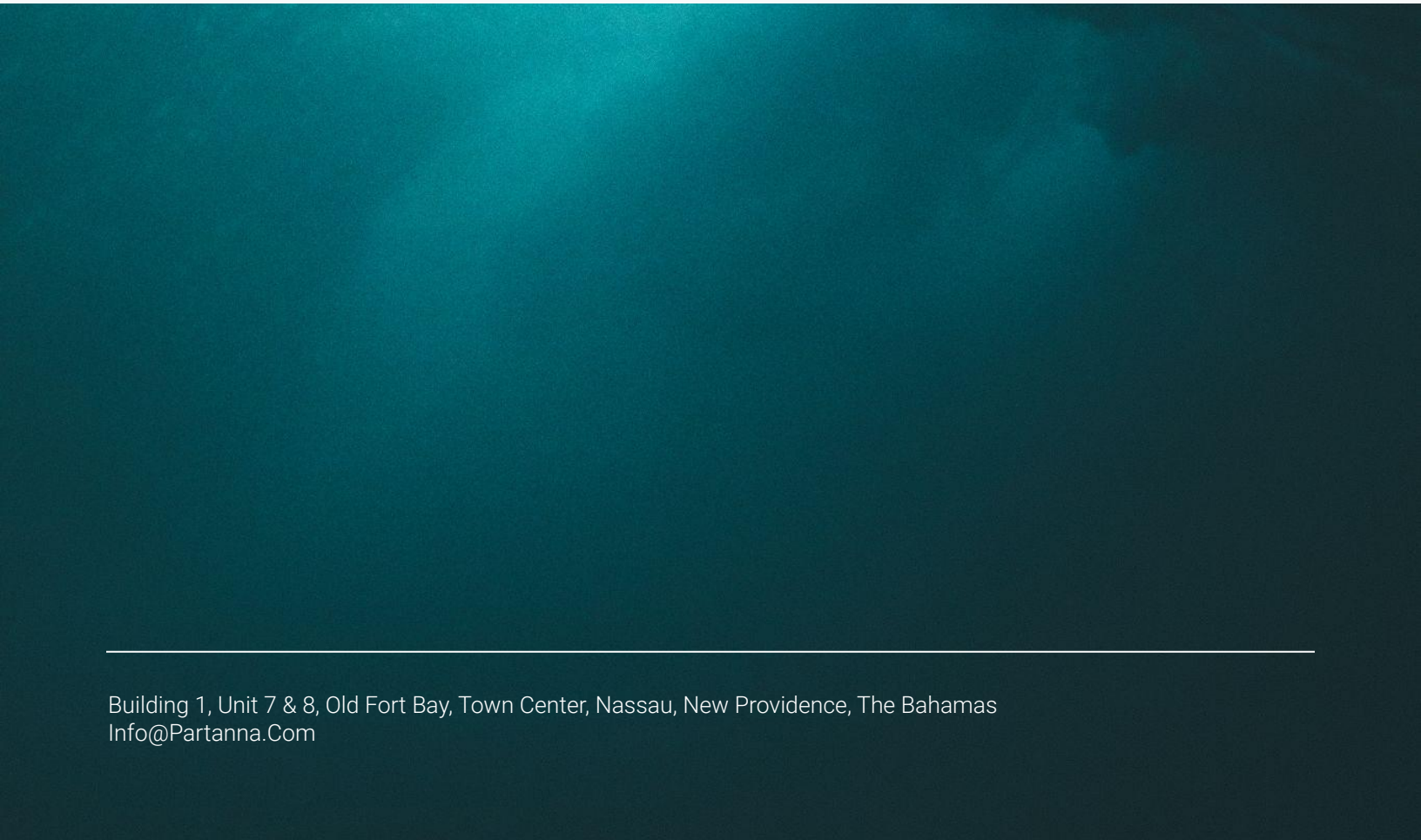
**Predicted Air Concentrations are based on modeling predicted concentration parameters shown above.

PARTANNA™

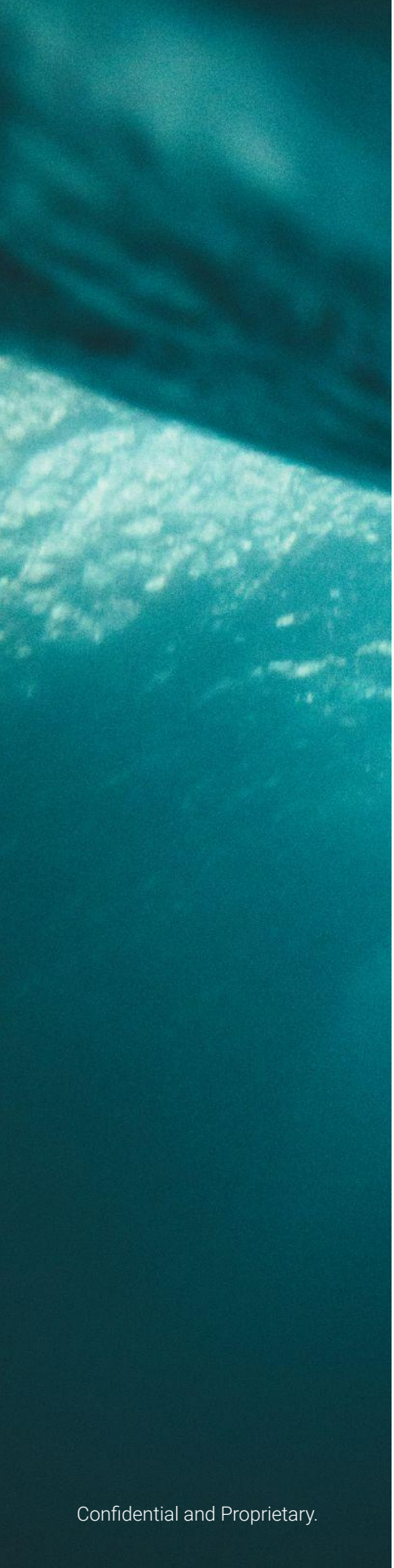
Last updated July 13, 2023

Carbon Credit Offerings

Q2 2023 Partanna Production Scenarios



Building 1, Unit 7 & 8, Old Fort Bay, Town Center, Nassau, New Providence, The Bahamas
Info@Partanna.Com



Removal & Avoidance Credits

Partanna's technology has the ability to generate both avoidance and removal carbon offsets. Several scenarios of potential credit generation are illustrated here, with the supporting calculations:

- CMU block
- Applied CMU block with mortar
- 1,250 ft^2 home
- 100,000 m^2 pavers

Avoidance credits. Partanna's innovative carbon-negative building material is just as affordable, versatile, and durable as traditional cement. However its manufacturing process completely eliminates the use of Portland cement and is made from an alternative binder that uses natural or recycled ingredients, including materials reclaimed from brine and pozzolans such as steel slag. This binder is mixed with natural, recycled stones and cured at ambient temperature. Thus, the technology enables Partanna to generate avoidance credits from the displacement of cement.

Removal credits. Another major advantage is that this mix of materials can generate removal credits, through its absorption of CO_2 – both at production and throughout the life of the concrete. Approximately 20% of the removals occur during the initial curing period, and then the concrete continues to significantly absorb carbon over the next 20 years. Concrete made with this technology captures CO_2 directly from the air and mineralizes it in the concrete.

Timing of credit generation. Each scenario below breaks out how many removal credits are generated in the initial curing period and the remaining period over the material's lifetime, so that stakeholders can see how many credits would be available and according to what timeline.

CMU Block

Consider:

1. Each Partanna Masonry Unit = 0.0076 m^3 volume of concrete, 38.5 lb (17.5 kg)

2. **Carbon Removal, 11.2 kg (24.6 lb)**:
   Partanna block material testing confirms CO_2 absorption of 32 kg CO_2/mt/yr [*1*]

   So, for one block:
   17.5 kg X 0.001 mt/kg X 32 kg CO_2/mt/yr X 20 yrs = 11.2 kg CO_2

3. **Carbon Avoidance, 3.08 kg (6.83 lb)**: Partanna Masonry Units avoid 405 kg CO_2/m^3 [*2*]
   So: 0.0076 m^3 X 405 kg CO_2/m^3 = 3.08 kg of CO_2 is avoided per block

   Total Carbon Credit Potential (Avoidance + Removal) = 11.2 kg + 3.1 kg = 14.3 kg (31.4 lb) per block

Initial Period Total: 5.3 kg **Remaining Period Total Over Lifetime: 9 kg**

Applied CMU Block

Consider:

1. **Carbon Removal, 22.6 kg (49.8 lb)**:
   11.2 kg (block, above) + [For Mortar/Filling] 11.2 kg CO_2/block X 1.02 kg mortar/kg block = 22.6 kg CO_2

2. **Carbon Avoidance, 6.22 kg (13.7 lb)**:
   3.08 kg (block, above) + 3.08 kg CO_2/block X 1.02 kg mortar/kg block = 6.22 kg CO_2

3. **Total Carbon Credit Potential (Avoidance + Removal) = 28.8 kg (63.5 lb) per block**

Initial Period Total: 10.7 kg **Remaining Period Total Over Lifetime: 18.1 kg**

---

1. Power, I., Rausis, K., Dostie, L., CO2 Mineralization Testing for Partanna Products, Trent University, December 2022.
2. Dupont EPD High Test CMU 900003403, Aug. 31, 2021, https://www.basalite-cmu.com/_files/ugd/31fd52_c399e811721a4fa4b9fe9cf4bd91c2e6.pdf

One House - 1,250 ft^2

182.6 credits (79.9 Initial + 102.7 Lifetime); 128.4 Removal + 54.2 Avoidance

Consider:

1. Each Partanna House uses 3,000 applied CMU blocks
2. In addition to the mortar and fill for the applied CMU blocks, each Partanna home includes 62.9 m^3 of Partanna concrete in the foundation, slab, porch, roof tiles, driveway and sidewalks.

Carbon Removal 128.4 credits (25.7 Initial + 102.7 Lifetime)

1. **Applied CMU blocks, 67.8 credits:** Each applied Partanna block, mortar and fill removes 22.6 kg (see above)

   So, the blocks from each house 22.6 kg X 3,000 blocks/house= 67,800 kg CO_2 or 67.8 mt (credits)

2. **Foundations, footings, slab, porch, roof tiles, driveway and sidewalks, 60.6 credits:**

   Partanna block material testing confirms CO_2 absorption of 32 kg CO_2/mt/yr [*1*]. Density of the concrete is 1,505 kg/m^3(or 94 lb/ft^3)

   So:62.9 m^3 X 1,505 kg/m^3 X 0.001 mt/kg X 32 kg CO_2/mt/yr X 20 yrs

   = 60,585 kg or 60.6 mt CO_2 (credits)

The total removal is roughly equivalent to 12,230 trees [3]

1. Power, I., Rausis, K., Dostie, L., *CO_2 Mineralization Testing for Partanna Products*, Trent University, December 2022.
2. Dupont EPD High Test CMU 900003403, Aug. 31, 2021, https://www.basalite-cmu.com/_files/ugd/31fd52_c399e811721a4fa4b9fe9cf4bd91c2e6.pdf
3. For a medium growth, coniferous tree https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality

Carbon Avoidance, 54.2 credits

1. **Applied CMU blocks, 18.7 credits:** Each applied Partanna block avoids 6.24 kg (see above)

   So, the blocks from each house avoid 6.24 kg X 3,000 blocks/house = 18,720 kg CO_2 or 18.7 mt (credits)

2. **Foundations, footings, slab, porch, roof tiles, driveway and sidewalks, 25.5 credits:** Partanna concrete avoids 405 kg CO_2/m^3

   So: 62.9 m^3 X 405 kg CO_2/m^3 = 25,475 kg or 25.5 mt (credits) of CO_2

3. **Additional avoidances from building process, 10 credits:** Conservatively, each Partanna house avoids 10 mt of CO_2 by eliminating the need for a number of high-carbon emitting building materials.

4. **Total Carbon Credit Potential (Avoidance) = 18.7 mt + 25.5 mt + 10 mt (credits) = 54.2 credits per house**

Total Carbon Credit Potential (Removal + Avoidance) = 128.4 mt + 54.2 mt

= 182.6 credits per house

Initial Credits Total: 79.9

Remaining Credit Total Over Lifetime: 102.7

1. Power, I., Rausis, K., Dostie, L., *CO_2 Mineralization Testing for Partanna Products*, Trent University, December 2022.
2. Dupont EPD High Test CMU 900003403, Aug. 31, 2021, https://www.basalite-cmu.com/_files/ugd/31fd52_c399e811721a4fa4b9fe9cf4bd91c2e6.pdf
3. For a medium growth, coniferous tree https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality

Pavers - Installing 100,000 m^2 of Pavers

Consider:

1. Partanna pavers are 3 in. thick (0.2286 m).

   So, 100,000 m^2 of pavers is made of 22,860 m^3

2. Density of the concrete is 1,505 kg/m^3 (or 94 lb/ft^3)

   So: 22,860 m^3 X 1,505 kg/m^3 X 0.001 mt/kg = 34,404 mt concrete is used in pavers

Carbon Removal 22,018 credits

3. Partanna block material testing confirms CO_2 absorption of 32 kg CO_2/mt/yr [*1*]
4. So, 34,404 mt X 32 kg CO_2/mt/yr X 20 yrs X 0.001 mt/kg = 22,018 mt CO_2 is removed from the atmosphere

That removal is roughly equivalent to 1.35 million trees

Carbon Avoidance, 9,258 credits

5. Partanna avoids 405 kg CO_2/m^3
6. So: 22,860 m^3 X 405 kg CO_2/m^3= 9,258,300 kg or 9,258 mt of CO_2 is potentially avoided from 100,000 m^2 of pavers

Total Carbon Credit Potential (Removal + Avoidance) = 22,018 mt + 9,258 mt (credits) = 31,276 credits

Initial Credits Total: 13,661 **Remaining Credit Total Over Lifetime: 17,614**

1. Power, I., Rausis, K., Dostie, L., *CO_2 Mineralization Testing for Partanna Products*, Trent University, December 2022.
2. Dupont EPD High Test CMU 900003403, Aug. 31, 2021, https://www.basalite-cmu.com/_files/ugd/31fd52_c399e811721a4fa4b9fe9cf4bd91c2e6.pdf
3. For a medium growth, coniferous tree https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality

Trees Equivalency

Unlike a tree, Partanna's products do not need to be watered. In fact, with Partanna's brine-based technology, fresh water is not required at all.

Consider:

According to the U.S. EPA [3] CO_2 absorption equivalency for a medium-growth coniferous tree allowed to grow for 10 years is 23.2 lb CO_2 (10.5 kg)

So:

1. **1 CMU Block ≅ 1 tree:**
   Each block removes 11.2 kg, which is equivalent one tree

2. **1 Applied CMU Block ≅ 2 trees:**
   Each Applied CMU block removes 20.4 kg, which is equivalent to two trees

3. **1,250 ft^2 house ≅ 12,230 trees:**
   Each 1,250 ft^2 home removes 128.4 mt, which is equivalent to 12,230 trees

4. **100,000 m^2 Pavers ≅ a forest of over 1.38 million trees:** 100,000 m^2 removes 22,018 mt (22,018,000 kg), which is equivalent to a forest with over 1.38 million trees

Note that this equivalency only factors in Partanna's net carbon removal. It does not account for the avoided emissions.

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1. Power, I., Rausis, K., Dostie, L., *CO_2 Mineralization Testing for Partanna Products*, Trent University, December 2022.
2. Dupont EPD High Test CMU 900003403, Aug. 31, 2021, https://www.basalite-cmu.com/_files/ugd/31fd52_c399e811721a4fa4b9fe9cf4bd91c2e6.pdf
3. For a medium growth, coniferous tree https://www.epa.gov/indoor-air-quality-iaq/introduction-indoor-air-quality

PARTANNA™

Last updated May 9, 2023

Partanna Carbon Removal

2023 Summary of Testing Results at Trent University

Building 1, Unit 7 & 8, Old Fort Bay, Town Center, Nassau, New Providence, The Bahamas
Info@Partanna.Com

Overview

In May of 2022, Partanna contracted Trent University, to conduct testing on various Partanna material samples to determine the CO2 removal rates [*1*]. The purpose of the tests were to determine the potential CO_2 removal both at atmospheric and high CO_2 concentrations during the following timeframes:

- Immediately after initial curing
- In the time period after initial curing

Three types of samples were tested:

- Lab-cured cement coupons (mortar)
- Brick (porous) samples
- Tile (compressed product) samples

Results confirm that brick, tile, and lab-made cement coupons remove CO_2 from the atmosphere and offer a significant, fast and permanent sink for atmospheric CO_2. As evidenced by the increase in total inorganic carbon of lab-made coupons when compared to the brick and tile samples, CO_2 removal rates are faster during the curing than after curation.

Atmospheric CO_2 conditions
Even at atmospheric CO_2 conditions and concentrations, the aged brick (porous sample) ***removes CO_2 at a rate of 32 kg/t/yr (Table 1)***. Meanwhile, the lab-made coupons confirm 33-50 kg/t/yr at atmospheric conditions, which is 9-56% faster than the results for the aged brick samples. ***These results confirm the conservative assumption that 20% of the absorption occurs during initial curing.***

High CO_2 concentrations
The results in a high CO_2 environment show that the rate of carbonation could increase anywhere from 38% to more than 200% under these conditions. However, the cost and energy demand of doing so seems unnecessary given the promising results at atmospheric conditions.

Discussion of the various research activities and their relevance

Testing Activity	**Samples Tested**	**CO2 Removal Rate [*1*] (Atmospheric CO_2)**
Activity 1 – Times-series analysis of total inorganic carbon (TIC) with atmospheric CO_2	Lab-cured cement coupons (mortar)	33-50 kg/t/yr
Activity 2 – Time-series analysis of TIC with atmospheric CO_2	Brick and compressed tile samples	18 kg/t/yr; 0.42 kg/m^2/yr -
Activity 3 – Time-series analysis of TIC at high CO_2 conditions	Brick and Compressed tile samples	25 kg/t/yr; 0.69 kg/m^2/yr -
Additional Activity 1 – CO_2 drawdown experiments, monitoring change of CO_2 concentrations in a closed container	Brick and compressed tile samples	***32 kg/t/yr; 0.72 kg/m^2/yr*** 11 kg/t/yr; 0.19 kg/m^2/yr

When reviewing the attached report, keep the following in mind:

- ***Additional Activity 1 provides the most reliable result.*** For the purposes of calculating the CO_2 absorption for Partanna materials, it is better to use the results of "Additional activity 1" (CO_2 Drawdown Experiment), which measures the net carbon removed from the closed atmosphere.and is therefore independent of carbonate spatial variability within the sample.
- ***Sample compositions and ages are not identical.*** It is also important to note that the cement coupons are not identical to the brick and tile samples that were tested in Activities 2 and 3. For example, the lab-made coupons likely have different porosities than the brick and tile. The brick sample is representative of Partanna pavers, CMUs and poured in place foundations, mortar, etc. Meanwhile, the brick and tile samples were over 3 months old when testing began, and over 9 months old upon completion. So, the brick and tile results are more indicative of the slower mineralization rates that occurs after initial curing.
- ***Testing confirms initial absorption assumption of 20%.*** The main conclusion from Activities 1-3 is that the carbon removal in the coupons (which represents carbonation upon initial curing) is at least 32% faster than the rates that occur in subsequent months. This confirms the conservative assumption that at least 20% occurs during the first curing year.

1. Power, I., Rausis, K., Dostie, L., *CO2 Mineralization Testing for Partanna Brick, Tile and Mortar Samples,* Trent University, April 2022.