TESTING ENGINEERS, INC.

Quality Assurance Services
Materials Consulting
Since 1954

Laboratory No.: N573

ASTM C97 Absorption

Specimen ID	1	2	3	4	5
Oven Dry Mass. A (g)	305.365	301.992	316.283	303.584	319.239
Saturated Mass. B (g)	317.168	312.526	327.537	313.885	330.404
Saturated. Immersed Mass. C (g)	185.950	184.410	193.170	185.350	194.880
Absorption. %	3.87	3.49	3.56	3.39	3.50
Bulk Specific Gravity	2.33	2.36	2.35	2.36	2.36
Average Absorption (%)	**3.56**				
St. Dev. Of Absorption (%)	0.180				
Average Bulk Specific gravity	**2.35**				
St. Dev. Of Specific gravity	0.014				

Tested in accordance with ASTM C97.
Tested with Mettler 1,200 g scale SN 163585. Torball AD500 SN 105001062 and Extech 421502 S/N 51000488

Comments:

TESTING ENGINEERS. INC.

11/4/21

By: John Anzaldo, Staff Engineer

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Auth JA 8/17/21

Solar Reflectance Index (SRI)

Solar Reflectance		Thermal Emittance		SRI		
Average	St.Dev.	Average	St.Dev.	Low-Wind	Med-Wind	High-Wind
0.554	0.004	0.90	0.00	65	66	66

The test methods used included ASTM C 1549-16: Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Reflectometer and ASTM C 1371-15: Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers. Thermal emittance measurement for samples was modified in accordance with Devices and Services Company's Tech Note 04-1. Both of these methods are Energy Star, Leadership in Energy and Environmental Design (LEED), and Cool Roof Rating Council (CRRC) approved methods for determining radiative properties.

The solar reflectance index (SRI) was calculated in compliance with ASTM E 1980-11: Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

Reflectance measurements were conducted using a Devices and Services SSR-ER Version 6.4 Reflectometer operated in v5 emulation mode and calibrated with Devices and Services Reference Tile # D-18.

Emittance measurements were conducted using a Devices and Services Emissometer Model AE calibrated with Devices and Services Reference Standards: High Emittance: 0.86 and Low Emittance: 0.06. Thermal emittance measurement for sample was modified in accordance with Devices and Services Company's Tech Note 04-1.

SRI calculations per ASTM E 1980 Approach II utilize the following assumptions: Low-Wind $h_c = 5\ W/m^2 \cdot K$, Medium-Wind $h_c = 12\ W/m^2 \cdot K$, and High-Wind $h_c = 30\ W/m^2 \cdot K$.

Remarks: Tested by PRI Construction Materials Technologies LLC

Laboratory No.: N573

COEFFICIENT OF FRICTION

ASTM C1028, Withdrawn 2014

Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

Calibrated Weight Serial No.: 50#
Sand Paper Grit: P400
Neolite Heel Dimensions (in.) 3x3
Neolite Resurfaced: Yes
Verified Current ASTM Ed.: 07e1

Sheen removal: ☒ Yes ☐ No
Distilled water: ☒ Yes ☐ No
Sample condition (cleaned, as-received, etc.): cleaned
Type and dimensions of test surface: 6x6x2.5"
Test location (If field, describe conditions fully e.g. cleanliness, wax, temp,etc.): Lab
SOP 20.200

Dry Calibration (lbs)	Dry Reading (lbs)	Dry Reading (lbs)	Dry Reading (lbs)	Dry Cal. Factor	Dry COF
29.9	37.9	36.9	38.1	0.27	0.98
31.1	36.2	35.8	34.1		
29.2	36.1	34.9	37.8		
31.0	38.1	35.9	36.3		
Wet Calibration (lbs)	Wet Reading (lbs)	Wet Reading (lbs)	Wet Reading (lbs)	Wet Cal. Factor	Wet COF
21.9	34.1	34.7	34.2	0.09	0.78
22.1	34.3	36.1	35.7		
21.1	33.7	35.8	36.0		
21.8	36.2	35.9	35.9		

Tested in accordance with ASTM C1028-07

Precision: The standard deviation between the data obtained from six laboratories was 0.07 for dry calibration values and 0.05 for wet calibration values.

ASTM C67 Freeze Thaw

P.O. o.: PO 00000803

Test Completed: 11/4/2021

Specimen ID	A	B	C	D	E
Initial mass (g)	640.7	632.2	634.6	623.9	622.95
Final Mass (g)	639.5	631.1	633.5	622.9	621.9
Weight loss (%)	**0.19**	**0.17**	**0.17**	**0.16**	**0.17**
Pass/Fail	Info Only	Info Only	Info Only	Info Only	Info Only

Tested in accordance with ASTM C67.
Tested with Mettler 1.200 g scale SN 163585, and Extech 421502 S 51000488

Comments:

P.O. No.: P000000803

Item: Indiana Limestone

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Wet/Dry	Dry	Dry	Dry	Dry	Dry
Rift Parallel/Perpendicular to Load	Perpendicular	Perpendicular	Perpendicular	Perpendicular	Perpendicular
Time Conditioned (h)	57	57	57	57	57
Width (in.)	1.98	1.99	1.97	1.97	2.06
Length (in.)	1.96	2.00	1.98	1.98	2.01
Height (in.)	2.04	2.04	2.08	2.05	2.03
Area (in^2)	3.9	4.0	3.9	3.9	4.1
Maximum Load (lbf)	38,921	34,942	39,298	37,737	40,984
Compressive Strength (psi)	10,000	8,800	10,100	9,670	9,900

Average Strength (psi) **9,694**
St. Dev. of Strength (psi) 524.6

Material identified by client.

Tested in accordance with ASTM C170 at approximatley 1.000 psi/min.
Tested with Instron 5985 SN B17048, Fowler 6" S/N TE-0601and Extech 421502 S/N 51000488

Comments:

ASTM C170 Compressive Stren th

P.O. o.: P000000803

Item: Indiana Limestone

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Wet/Dry	Dry	Dry	Dry	Dry	Dry
Rift Parallel/Perpendicular to Load	Parallel	Parallel	Parallel	Parallel	Parallel
Time Conditioned (h)	57	57	57	57	57
Width (in.)	1.97	2.04	2.03	1.95	2.09
Length (in.)	2.08	1.98	1.98	2.03	2.00
Height (in.)	1.96	1.98	1.96	2.01	2.05
Area (in^2)	4.1	4.0	4.0	4.0	4.2
Maximum Load (lbf)	31,631	30,577	26,453	28,311	29,363
Compressive Strength (psi)	7,700	7,600	6,580	7,140	7,030

Average Strength (psi)	**7,210**
St. Dev. of Strength (psi)	454.5

Material identified by client.

Tested in accordance with ASTM C170 at approximatley 1,000 psi/min.
Tested with Instron 5985 S B17048, Fowler 6" S TE-0601and Extech 421502 S/N 51000488

Comments:

ASTM C170
Compressive Strength

P.O. No.: P000000803

Indiana Limestone

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Wet/Dry	Wet	Wet	Wet	Wet	Wet
Rift Parallel/Perpendicular to Load	Perpendicular	Perpendicular	Perpendicular	Perpendicular	Perpendicular
Time Conditioned (h)	54	54	54	54	54
Width (in.)	2.00	1.98	2.00	1.98	1.96
Length (in.)	1.98	1.96	1.96	1.98	1.97
Height (in.)	2.03	2.08	2.08	2.06	2.05
Area (in^2)	4.0	3.9	3.9	3.9	3.9
Maximum Load (lbf)	31,869	32,649	34,775	32,769	31,045
Compressive Strength (psi)	8,050	8,420	8,880	8,360	8,040

Average Strength (psi)	**8,350**
St. Dev. of Strength (psi)	343.5

Material identified by client.

Tested in accordance with ASTM C170 at approximatley 1,000 psi/min.
Tested with Instron 5985 SN B17048, Fowler 6" S/N TE-0601and Extech 421502 S/N 51000488

Comments:

ASTM C170
Compressive Strength

P.O. No.: P000000803

Item: Indiana Limestone

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Wet/Dry	Wet	Wet	Wet	Wet	Wet
Rift Parallel/Perpendicular to Load	Parallel	Parallel	Parallel	Parallel	Parallel
Time Conditioned (h)	54	54	54	54	54
Width (in.)	1.95	2.05	1.96	2.04	2.05
Length (in.)	2.05	1.97	2.08	1.97	1.96
Height (in.)	2.01	1.95	1.97	1.95	1.98
Area (in^2)	4.0	4.0	4.1	4.0	4.0
Maximum Load (lbf)	21,199	22,909	27,288	26,654	23,790
Compressive Strength (psi)	5,320	5,680	6,690	6,650	5,930

Average Strength (psi)	**6,054**
St. Dev. of Strength (psi)	602.9

Material identified by client.

Tested in accordance with ASTM C170 at approximatley 1.000 p i/min.
Tested with Instron 5985 SN B17048, Fowler 6" S/N TE-0601and Extech 421502 S/N 51000488

Comments:

Item: Indiana Limestone

P.O. No.: P000000803

Test Date: 9/13/21

Specimen ID	1	2	3	4	5
Width (in.)	4.00	4.04	4.05	4.06	4.04
Average Thickness (in.)	2.34	2.34	2.34	2.31	2.31
Wet/Dry	Dry	Dry	Dry	Dry	Dry
Rift Parallel or perpendicular to Load	NS	NS	NS	NS	NS
Span (in)	7.00	7.00	7.00	7.00	7.00
Ultimate Load (lbf)	2,922	3,073	3,139	3,181	3,084
MoR (psi)	1,401	1,459	1,486	1,542	1,502
Average MoR (psi)	**1,478**				
St. Dev. MoR (psi)	52.5				
Difference from Average (%)	5.2	1.3	0.6	4.3	1.6

Material identification not provided by client. Limestone material.

If specimen differed from average by more than 20%, it was evaluated for defects and if found, removed from the average.

Tested in accordance with ASTM C99 with 7" span and 1" plunger and load block.
Tested with Instron 5985 SN B17048, Fowler 6" Digital Calipers S/N TE-0601 and Extech 421502 S/N 51000488

Auth JA 8/17/21

Item: Indiana Limestone

P.O. No.: P000000803

Test Date: 9/21/21

Specimen ID	1	2	3	4	5
Width (in.)	4.01	4.03	4.03	4.00	4.03
Average Thickness (in.)	2.34	2.30	2.34	2.32	2.35
Wet/Dry	Dry	Dry	Dry	Dry	Dry
Rift Parallel or perpendicular to Load	NS	NS	NS	NS	NS
Span (in)	7.00	7.00	7.00	7.00	7.00
Ultimate Load (lbf)	2,751	3,062	2,819	3,247	3,310
MoR (psi)	1,316	1,508	1,341	1,584	1,562
Average MoR (psi)	**1,462**				
St. Dev. MoR (psi)	125.3				
Difference from Average (%)	10.0	3.2	8.3	8.3	6.8

Material identification not provided by client. Limestone material.

If specimen differed from average by more than 20%, it was evaluated for defects and if found, removed from the average.

Tested in accordance with ASTM C99 with 7" span and 1" plunger and load block.
Tested with Instron 5985 SN B17048, Fowler 6" Digital Calipers S/N TE-0601 and Extech 421502 S/N 51000488

Comments:

Auth JA 8/17/21

Item: Indiana Limestone P.O. No.: P000000803

Test Date: 9/13/21

Specimen ID	1	2	3	4	5
Width (in.)	4.03	4.01	4.02	4.02	4.01
Average Thickness (in.)	2.30	2.30	2.30	2.35	2.34
Wet/Dry	Wet	Wet	Wet	Wet	Wet
Rift Parallel or perpendicular to Load	NS	NS	NS	NS	NS
Span (in)	7.00	7.00	7.00	7.00	7.00
Ultimate Load (lbf)	2,449	2,534	2,678	2,481	2,608
MoR (psi)	1,206	1,254	1,322	1,173	1,247
Average MoR (psi)	**1,241**				
St. Dev. MoR (psi)	56.1155				
Difference from Average (%)	2.8	1.1	6.6	5.4	0.5

Material identification not provided by client. Limestone material.

If specimen differed from average by more than 20%, it was evaluated for defects and if found, removed from the average.

Tested in accordance with ASTM C99 with 7" span and 1" plunger and load block.
Tested with Instron 5985 SN B17048, Fowler 6" Digital Calipers S/N TE-0601 and Extech 421502 S/N 51000488

Comments:

Auth JA 8/17/21

Item: Indiana Limestone

P.O. No.: P000000803

Test Date: 9/21/21

Specimen ID	1	2	3	4	5
Width (in.)	3.99	4.04	3.99	4.01	4.02
Average Thickness (in.)	2.34	2.31	2.35	2.31	2.30
Wet/Dry	Wet	Wet	Wet	Wet	Wet
Rift Parallel or perpendicular to Load	NS	NS	NS	NS	NS
Span (in)	7.00	7.00	7.00	7.00	7.00
Ultimate Load (lbf)	2,426	2,614	2,181	2,330	2,169
MoR (psi)	1,166	1,273	1,039	1,143	1,071
Average MoR (psi)	**1,139**				
St. Dev. MoR (psi)	91.2706				
Difference from Average (%)	2.4	11.8	8.7	0.4	5.9

Material identification not provided by client. Limestone material.

If specimen differed from average by more than 20%, it was evaluated for defects and if found, removed from the average.

Tested in accordance with ASTM C99 with 7" span and 1" plunger and load block.
Tested with Instron 5985 SN B17048, Fowler 6" Digital Calipers S/N TE-0601 and Extech 421502 S/N 51000488

Comments:

Auth JA 8/17/21

P.O. No.: P000000803

Item: Indiana Limestone

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Width (in.)	4.000	3.950	4.000	4.020	4.000
Thickness (in.)	1.310	1.300	1.310	1.310	1.300
Wet/Dry	Dry	Dry	Dry	Dry	Dry
Rift parallel or perpendicular to load	NS	NS	NS	NS	NS
Major Span (in)	13.10	13.00	13.10	13.10	13.00
Minor Span (in.)	6.55	6.50	6.55	6.55	6.50
Ultimate Load (lbf)	893	862	942	937	895
Flexure Strength (psi)	1,278	1,259	1,348	1,334	1,291
Average Strength (psi)	**1,302**				
St. Dev. Strength (psi)	37.9				

Material identification provided by client. Limestone material with wide faces with fine abrasion.

Tested in accordance with ASTM C880 with 1" diameter plunger and load block.
Tested with Instron 5985 SN B17048 at approximatly 600 psi/min. Fowler 6" TE-0601 and Extech 421502 S/N 51000488

Comments:

Auth JA 8/17/21

ASTM C880
Flexure Strength

Item: Indiana Limestone

P.O. No.: P000000803

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Width (in.)	4.00	3.99	3.97	3.99	3.97
Thickness (in.)	1.30	1.30	1.30	1.30	1.31
Wet/Dry	Dry	Dry	Dry	Dry	Dry
Rift parallel or perpendicular to load	NS	NS	NS	NS	NS
Major Span (in)	13.00	13.00	13.00	13.00	13.10
Minor Span (in.)	6.50	6.50	6.50	6.50	6.55
Ultimate Load (lbf)	913	896	855	754	798
Flexure Strength (psi)	1,317	1,296	1,242	1,090	1,151
Average Strength (psi)	**1,219**				
St. Dev. Strength (psi)	96.5				

Material identification provided by client. Limestone material with wide faces with fine abrasion.

Tested in accordance with ASTM C880 with 1" diameter plunger and load block.
Tested with Instron 5985 SN B17048 at approximatly 600 psi/min. Fowler 6" TE-0601 and Extech 421502 S/N 51000488

Comments:

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Auth JA 8/17/21

ASTM C880
Flexure Strength

P.O. No.: P000000803

Item: Indiana Limestone

Test Date: 9/14/21

Specimen ID	1	2	3	4	5
Width (in.)	4.020	4.000	3.970	3.930	4.020
Thickness (in.)	1.300	1.300	1.300	1.300	1.310
Wet/Dry	Wet	Wet	Wet	Wet	Wet
Rift parallel or perpendicular to load	NS	NS	NS	NS	NS
Major Span (in)	13.00	13.00	13.00	13.00	13.10
Minor Span (in.)	6.50	6.50	6.50	6.50	6.55
Ultimate Load (lbf)	694	664	587	552	730
Flexure Strength (psi)	996	958	853	810	1.040
Average Strength (psi)	**931**				
St. Dev. Strength (psi)	96.7				

Material identification provided by client. Limestone material with wide faces with fine abrasion.

Tested in accordance with ASTM C880 with 1" diameter plunger and load block.
Tested with Instron 5985 SN B17048 at approximatly 600 psi/min, Fowler 6" TE-0601 and Extech 421502 S/N 51000488

Comments:

Laboratory No.: N573

ASTM C880
Flexure Strength

P.O. No.: P000000803

Item: Indiana Limestone

Test Date: 9/21/21

Specimen ID	1	2	3	4	5
Width (in.)	3.970	3.980	3.960	4.010	3.980
Thickness (in.)	1.310	1.310	1.300	1.310	1.300
Wet/Dry	Wet	Wet	Wet	Wet	Wet
Rift parallel or perpendicular to load	NS	NS	NS	NS	NS
Major Span (in)	13.10	13.10	13.00	13.10	13.00
Minor Span (in.)	6.55	6.55	6.50	6.55	6.50
Ultimate Load (lbf)	651	676	671	687	668
Flexure Strength (psi)	939	972	978	981	968
Average Strength (psi)	**968**				
St. Dev. Strength (psi)	16.8				

Material identification provided by client. Limestone material with wide faces with fine abrasion.

Tested in accordance with ASTM C880 with 1" diameter plunger and load block.
Tested with Instron 5985 SN B17048 at approximatly 600 psi/min. Fowler 6" TE-0601 and Extech 421502 S/N 51000488

Comments: