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Faculty of Engineering & Architecture
Department of Civil Engineering
Division of Construction Materials
Construction Materials Research Laboratory

A Report on TECHNICAL PROPERTIES OF LAVACOAT

Submitted To:
Meza Commodities Florida
18201 Collins Avenue, Unit 409,
Sunny Isles Beach, FL 33160,
United States of America

Report No:
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Approved By
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TECHNICAL PROPERTIES OF
LAVACOAT

This report was officially submitted to **Meza Commodities Florida** (18201 Collins Avenue, Unit 409, Sunny Isles Beach, FL 33160, United States of America) representing the experimental analysis results of the sample coded as **"LAVACOAT"**.

LAVACOAT test samples were prepared in the form of hardened mortar samples in accordance with the mixing water and sample preparation specifications determined by the manufacturer. In the preparation of the test samples, according to the company recommendation, a minimum of 13 liters of water was added to 25 kg of LAVACOAT material, and a fresh mortar mixture was obtained by mixing at an average speed for at least 7 minutes. Then the fresh mortar was rested for 5 minutes and placed in the molds to be used for testing. Before the mixing process of the test sample in powder bulk form of LAVACOAT, the average unit volume weight value was determined as 738 kg/m^3 (46,07 lb/ft^3). After the mixing process, the average unit volume weight value of fresh mortar was determined as 1205 kg/m^3 (75,23 lb/ft^3).

The analyses were carried out in the Construction Materials Research Laboratory in İzmir Katip Çelebi University, İzmir, Turkey. On the request of **Meza Commodities Florida**, a series of analyses were carried out to determine the properties of hardened mortar samples based on the relevant TS EN standards. Upon the request of the manufacturer, this report has been prepared to include metric and imperial values in numerical data. The findings obtained are given as a technical opinion in the following.

The following analyses were carried out:

- Dry Bulk Density of Hardened Mortar
- Compressive Strength of Hardened Mortar
- Water Absorption Coefficient Due To Capillary Action
- Resistance To High Temperature
- Thermal Conductivity of Hardened Mortar
- Water Vapor Permeability Coefficient Analysis
- Sound Transmission Loss of Hardened Mortar
- Surface Hardness of Hardened Mortar
- Hazardous Substances of Hardened Mortar

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Dry Bulk Density of Hardened Mortar

Flow Rate of Sample Mortar (EN 1015-3)	=	161,3	(mm)
	=	6,35	(in)
Age of Mortar	=	6,20	(minute)

Sample No	Dry Weight $m_{s,dry}$ (kg)	Sample Volume V (m^3)	Dry Bulk Density of Hardened Mortar (kg/m^3)
1	0,884	0,001123	787
2	0,926	0,001168	793
3	0,859	0,001080	795
4	0,824	0,001052	783
5	0,867	0,001102	787
6			
Average	0,872	0,001105	789
		Standard Deviation:	4,73

Sample No	Dry Weight $m_{s,dry}$ (lb)	Sample Volume V (ft^3)	Dry Bulk Density of Hardened Mortar (lb/ft^3)
1	1,9489	0,039659	49,14
2	2,0415	0,041248	49,49
3	1,8938	0,038140	49,65
4	1,8166	0,037151	48,90
5	1,9114	0,038917	49,11
6			
Average	1,9224	0,039023	49,26
		Standard Deviation:	0,31

** Experimental analyses were carried out according to **TS EN 1015-10** standard.*

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Compressive Strength of Hardened Mortar

Flow Rate of Sample Mortar (EN 1015-3)	=	161,3	(mm)
	=	6,35	(in)
Age of Mortar	=	6,20	(minute)

Sample No	Dimensions of Applied Load Plate (mm)	Maximum Applied Load (N)	Compressive Strength of Hardened Mortar (N/mm^2)	Class of Hardened Mortar (TS EN 998-1)
1	40,00	4334,5	2,71	
2	40,00	4452,2	2,78	
3	40,00	4638,5	2,90	
4	40,00	4717,0	2,95	CS II
5	40,00	4305,1	2,69	
6	40,00	4785,6	2,99	
7				
Average	**40,00**	**4538,8**	**2,84**	
		Standard Deviation:	0,13	

Sample No	Dimensions of Applied Load Plate (in)	Maximum Applied Load (lbf)	Compressive Strength of Hardened Mortar (lbf/in^2)	Class of Hardened Mortar (TS EN 998-1)
1	1,5748	974,44	392,92	
2	1,5748	1000,90	403,59	
3	1,5748	1042,78	420,48	
4	1,5748	1060,43	427,59	CS II
5	1,5748	967,83	390,25	
6	1,5748	1075,85	433,81	
7				
Average	**1,5748**	**1020,37**	**411,44**	
		Standard Deviation:	18,42	

** Experimental analyses were carried out according to **TS EN 1015-11** standard.*

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Water Absorption Coefficient Due To Capillary Action of Hardened Mortar

Sample No	Initial Dry Weight M0 (g)	Moist Weight After 10 Minutes M1 (g)	Moist Weight After 90 Minutes M2 (g)	Water Absorption Coefficient C ($kg/m^2min^{0,5}$)	Water Absorption Coefficient Cm ($kg/m^2min^{0,5}$)	Class of Hardened Mortar (TS EN 998-1)
1	198,2	217,3	222,4	0,51		
2	203,1	221,2	225,4	0,42		
3	207,2	219,4	224,2	0,48		
4	195,3	208,1	212,7	0,46	**0,46**	**W0**
5	211,5	234,6	238,9	0,43		
6	188,1	212,3	216,9	0,46		
7						
Average	**200,6**	**218,8**	**223,4**	**0,46**		
			Standard Deviation:	0,03		

Sample No	Initial Dry Weight M0 (lb)	Moist Weight After 10 Minutes M1 (lb)	Moist Weight After 90 Minutes M2 (lb)	Water Absorption Coefficient C $x10^{-3}$ ($lb/in^2min^{0,5}$)	Water Absorption Coefficient Cm $x10^{-3}$ ($lb/in^2min^{0,5}$)	Class of Hardened Mortar (TS EN 998-1)
1	0,4370	0,4791	0,4903	0,725		
2	0,4478	0,4877	0,4969	0,597		
3	0,4568	0,4837	0,4943	0,683		
4	0,4306	0,4588	0,4689	0,654	**0,654**	**W0**
5	0,4663	0,5172	0,5267	0,612		
6	0,4147	0,4680	0,4782	0,654		
7						
Average	**0,4422**	**0,4824**	**0,4925**	**0,654**		
			Standard Deviation:	0,05		

** Experimental analyses were carried out according to **TS EN 1015-18** standard.*

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Resistance To High Temperature of Hardened Mortar

According to TS EN 13820:

Sample No	Cup Weight Before Testing (g)	Sample + Cup Weight Before Testing (g)	Sample + Cup Weight After Testing (g)	Content of Organic Material (% by weight)
1	112,32	151,22	150,88	**0,874**
2	119,84	160,37	160,01	**0,888**
3	113,56	156,71	156,31	**0,927**
4				
5				
6				
Average				**0,896**
			Standard Deviation:	0,027

Sample No	Cup Weight Before Testing (lb)	Sample + Cup Weight Before Testing (lb)	Sample + Cup Weight After Testing (lb)	Content of Organic Material (% by weight)
1	0,2476	0,3334	0,3326	**0,874**
2	0,2642	0,3536	0,3528	**0,888**
3	0,2504	0,3455	0,3446	**0,927**
4				
5				
6				
Average				**0,896**
			Standard Deviation:	0,027

Note: Oven dried bulk density of the tested sample is **790 kg/m^3** (**49,318 lb/ft^3**).

Explanation:

Organic material content of the tested sample is determined as 0.896% according to TS EN 13820. Due to organic material content less than 1% by weight, the sample could be described as "***not including organic material and fireproof material***". It could be also characterized as **A1 Class** material.

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Thermal Conductivity of Hardened Mortar

Test Results and Calculations		Average Value	Unit
Sample Thickness	:	32,5	mm
Sample Weight Before Testing	:	2044,0	g
Sample Weight After Testing	:	2032,0	g
Oven Dried Bulk Density	:	788	kg/m^3
Surface Temperature on Sample (Hot Part), (T_1)	:	43,52	°C
Surface Temperature on Sample (Cold Part), (T_2)	:	25,66	°C
Temperature Difference, (T_1-T_2)	:	17,86	°C
Moisture of sample by weight, (n_g)	:	0,591	%
Average Heat Flow, (Q)	:	5,314	W
Thermal Conductivity of Sample (λ)	:	**0,121**	W/mK

Test Results and Calculations		Average Value	Unit
Sample Thickness	:	1,280	in
Sample Weight Before Testing	:	4,506	lb
Sample Weight After Testing	:	4,480	lb
Oven Dried Bulk Density	:	49,19	lb/ft^3
Surface Temperature on Sample (Hot Part), (T_1)	:	110,34	°F
Surface Temperature on Sample (Cold Part), (T_2)	:	78,19	°F
Temperature Difference, (T_1-T_2)	:	32,15	°F
Moisture of sample by weight, (n_g)	:	0,591	%
Average Heat Flow, (Q)	:	18,132	Btu/h
Thermal Conductivity of Sample (λ)	:	**0,070**	Btu/h.ft.°F

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Water Vapor Permeability Coefficient of Hardened Mortar

The water vapor permeability is calculated according to the parameters stipulated in TS EN 1745 and ISO 12572 standards.

In the analysis based on the unit thickness of the test sample, gross dry unit weight, net dry unit volume weight values and the environmental conditions parameters, the Water Vapor Flow Density of the samples is **2,87** g/m^{2}h (5,87x10^{-4} lb/ft^{2}h) and Water Vapor Diffusion Resistance Coefficient is calculated as average value of **(μ) 9,4** for the 36,5 mm (1,44 in) sample thickness value.

Calculation Parameters (TS EN 1745 and TS EN ISO 12572)		
Oven Dried Dry Bulk Density (kg/m^3):	785	kg/m^3
Weight Difference, (ΔG), (ISO 12572) :	0,00059	kg
Time Difference, (ΔT) , (ISO 12572) :	41674,00	sec
Flow of Water Vapor (ΔG/ΔT), G, , (ISO 12572) :	1,41000E-08	kg/sec
Sample Area (A) :	0,0177	m^2
Flow Density of Water Vapor (g), (ISO 12572) :	7,96610E-07	kg/(m^{2}sec)
Temperature (T) , (ISO 12572) :	24,60	°C
Moisture (Q) , (ISO 12572) :	52,30	%
Transmittance of Water Vapor (Wc) , (ISO 12572) :	5,680E-10	kg/(m^2.sec.Pa)
Water Vapor Permeability (δ) , (ISO 12572) :	2,07318E-11	kg/(m.sec.Pa)
Water Vapor Permeability of Air (δa) , (ISO 12572) :	1,940E-10	kg/(m.sec.Pa)
Water Vapor Permeability Coefficient (μ) :	**9,4**	

Calculation Parameters (TS EN 1745 and TS EN ISO 12572)		
Oven Dried Dry Bulk Density (kg/m^3):	49,006	lb/ft^3
Weight Difference, (ΔG), (ISO 12572) :	0,00129543	lb
Time Difference, (ΔT) , (ISO 12572) :	41674,00	sec
Flow of Water Vapor (ΔG/ΔT), G, , (ISO 12572) :	3,1085E-08	lb/sec
Sample Area (A) :	0,1905	ft^2
Flow Density of Water Vapor (g), (ISO 12572) :	1,6316E-07	lb/(ft^{2}sec)
Temperature (T) , (ISO 12572) :	76,28	°F
Moisture (Q) , (ISO 12572) :	52,30	%
Water Vapor Permeability Coefficient (μ) :	**9,4**	

* *Experimental analyses were carried out according to* **TS EN 1015-19, TS EN 1745 and TS EN ISO 12572** *standards.*

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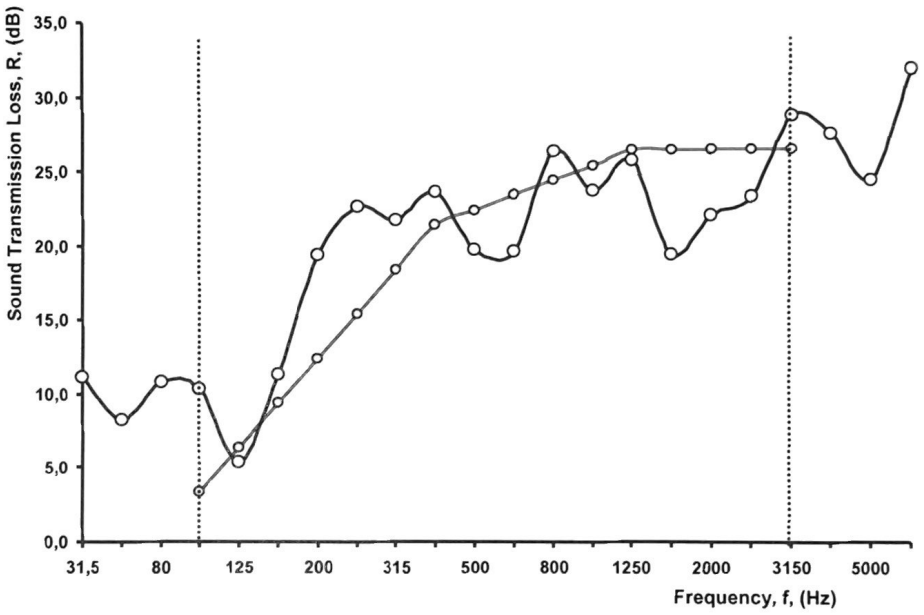
Sound Transmission Loss of Hardened Mortar

General Form of Test Sample:

Test specimens were prepared as rectangular specimens with the average thickness of 30 mm (1,18 in). Average unit area weighted density of test sample is 23,40 kg/m^2 (4,837 lb/ft^2). The test sample is an example of a hardened mortar formed of sheet-shaped and single layer. Both sides of the test specimen were smooth and flat shaped.

Frequency (Hz)	Sound Transmission Loss by 1/3 Octave (dB)
31,5	11,1
63	8,2
80	10,8
100	10,3
125	5,4
160	11,3
200	19,3
250	22,6
315	21,7
400	23,6
500	19,7
630	19,6
800	26,3
1000	23,7
1250	25,7
1600	19,3
2000	22,0
2500	23,2
3150	28,6
4000	27,4
5000	24,3
6300	31,7



According to the results obtained in the frequency range of 100 Hz to 3150 Hz in 1/3 octave band based on ISO 717-1 standard, calculated weighted sound reduction index

R = 22,4 dB

* In the preparation of the test specimens, both surfaces of the final samples were brought to a smooth and flat form. All measurements were carried out using a testing apparatus by one-room and one-face open sound measurement method in 1/3 octave band frequency range prescribed in ISO 717-1 standard. The value of Sound Transmission Loss for the sample was obtained as the difference between the background sound pressure level for the pre-analysis measurement scheme and the background sound pressure level with the sample.

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Surface Hardness of Hardened Mortar

General Form of Test Sample:

In order to make surface hardness measurements, test samples were prepared in the form of samples with rectangular geometry. The test sample is an example of a hardened mortar formed of sheet-shaped and single layer. Both sides of the test specimen were smooth and flat shaped.

A test sample of LAVACOAT hardened mortar was tested for hardness using a handheld instrument measuring the hardness ranges as Shore D. An average of 5 readings was taken. Tests were carried out at 23°C and 50% RH.

Sample Name	:	LAVACOAT hardened mortar
Sample Tickness	:	30 mm
	:	1,18 in
Average unit area weighted density	:	23,40 kg/m^2
	:	4,837 lb/ft^2
Shore D Hardness (average)	:	**43**

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Hazardous Substances of Hardened Mortar

For the purpose of the analysis of hazardous substances, the materials used in the test samples of **LAVACOAT** prepared in the form of hardened mortar were examined observationally in terms of chemicals that may be classified as hazardous materials or waste. In the sample composition, hazardous substances such as formaldehyde and asbestos, toxic substances and also no material composition capable of releasing gas was found. Therefore, the sample of **LAVACOAT** could be predicted to have a non-hazardous material integrity and **environmentally friendly product** form in terms of harmful substances.

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