

KERAMISCH-TECHNOLOGISCHES BAUSTOFFLABORATORIUM HAMBURG ^{E.}_{V.}

Staatlich anerkannte Prüfstelle

21465 REINBEK · UNTER DEN LINDEN 2 · TELEFON (040) 711 822-0



First recognized quality control of products in the brick making industry by decree of the minister of labour and social affairs and exiles of the state of Schleswig-Holstein dated 9/30/1954 (Schl.-H. Gazette 1954 No. 43 Pg. 440).

Test Certificate No. 40 345

dated 23 November 2015

(Translation, the German original is the authoritative version)

Applicant: CRH Clay Solutions GmbH
Werksstandort Oberlausitz
Buchholz 62 a
02894 Vierkirchen

Content of the application: Type test for bricks
according to DIN EN 771-1 / 2011

Sampling: On 25/08/2015 at the brickyard by
the sampler of the Güteschutz Ziegel e.V.

Item: Black HD clay brick, category I,
for unprotected brickwork in very severe environment

Declared values according to DIN EN 771-1:
Length: 215 mm, width 102,5 mm, height: 65 mm
Tolerance: Class T_m Range: Class R_m
Average compressive strength: $\geq 75 \text{ N/mm}^2$ (not standardised)
Gross dry density: 2100 kg/m^3
Net dry density: 2200 kg/m^3
Bulk density Tolerance: Class $D2$
Durability: Class $F2$

Factory designation: "British Standard - Potsdam "

Receipt of samples: 18/09/2015

Order no.: 535-1-2461

The certificate contains: 7 pages and 1 enclosure

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1. Performance of the tests

The bricks were sampled according to DIN EN 771-1 Appendix A, Section A.2.2.3. A total of 40 bricks were sampled.

The bricks were tested per the test specifications according to DIN EN 772-1 to DIN EN 772-21 and DIN V 52 252-3. (corresponds to CEN TS 772-22)

Analysis of the test results is based on the following dimensions and classes provided by the manufacturer.

2. Manufacturer declarations**2.1 Manufacturer declarations according to DIN EN 771-1**

Declared specified sizes: Nominal length: 215 mm - Nominal width: 102,5 mm - Nominal height: 65 mm

Declared tolerance class T_m for deviations from the specified sizes:
length: +4 mm / -9 mm, width: ± 5 mm, height: ± 3 mm

Declared tolerance class R_m for measuring range: length: 9 mm, width: 6 mm, height: 4 mm

Declared gross dry density: 2100 kg/m³

Declared net dry density: 2200 kg/m³

Requirement	Class	Tested according to
Limits of size	T_m	DIN EN 772-16
Measuring range	R_m	DIN EN 772-16
Dry density tolerance	D2	DIN EN 772-13+3
Average compressive strength (not standardised)	≥ 75 N/mm ² Category I	DIN EN 772-1
Water absorption	≤ 6 %	DIN EN 772-21
Durability: suitability for severe environments	F2	DIN V 52 252-3 / February 2005

2.2 Further manufacturer declarations according to DIN EN 771-1, verification of which is not included in the test order.

Active soluble salts content:

categories **S2**

Reaction to fire:

Euro Class A1

Water vapour permeability according to:

DIN EN 1745 Table A1

Composite strength according to:

DIN EN 998-2 Appendix C

3. Determining deviation according to DIN EN 772-16 / 2011 and oven-dry density according to DIN EN 772-13 / 2000 based on 772-3 / 1998 (under water weighing)

Sample No.:	Dimensions			Weight Dry [g]	Density	
	Length [mm]	Width [mm]	Height [mm]		Gross [kg/m³]	Net [kg/m³]
1	215,5	102,5	66,5	3251	2213	2269
2	215,0	104,0	66,5	3251	2186	2262
3	215,5	103,0	66,5	3260	2209	2270
4	215,5	103,0	67,5	3272	2184	2271
5	215,5	103,0	67,5	3283	2191	2270
6	215,5	103,0	66,5	3252	2203	2271
7	216,0	103,0	67,0	3279	2200	2272
8	216,5	104,0	67,0	3275	2171	2266
9	215,5	103,0	67,0	3252	2187	2261
10	215,5	103,0	66,5	3230	2188	2268
Mean	216	103	67	3261	2193	2268
Minimum value	215,0	102,5	66,5		2171	
Maximum value	216,5	104,0	67,5		2213	
Measuring range	1,5	1,5	1,0			
Target value	215	102,5	65			
Deviation	1	0	2			

4. Determining compressive strength according to DIN EN 772-1 / 2011

Samples were squared with mortar according to DIN EN 772-1 Section 7.2.5 and following adequate air hardening (> 90 % humidity) according to Section 7.3.2 a conditioned by storing in air (> 15 °C and < 65 % relative humidity) for 14 days prior to testing.

The masonry compressive strength was determined according to DIN 105-100 / January 2012.
(Form factor 0.8)

Sample No.:	Dimensions			Breaking load	Strength	Standardised Strength (EN 772-1)	brick compressive strength f_{st} (DIN 105-100) Form factor: 0.8
	Length	Width	Height after squaring				
	[mm]	[mm]	[mm]	[kN]	[N/mm ²]	[N/mm ²]	[N/mm ²]
1	215,5	102,5	71	2.114	95,7	83,2	76,6
2	215,0	104,0	70	2.114	94,5	81,6	75,6
3	215,5	103,0	71	2.114	95,2	82,8	76,2
4	215,5	103,0	70	2.114	95,2	82,4	76,2
5	215,5	103,0	71	2.114	95,2	82,8	76,2
6	215,5	103,0	71	2.114	95,2	82,8	76,2
7	216,0	103,0	70	2.114	95,0	82,2	76,0
8	216,5	104,0	71	2.114	93,9	81,5	75,1
9	215,5	103,0	70	2.114	95,2	82,4	76,2
10	215,5	103,0	71	2.114	95,2	82,8	76,2
Mean [N/mm ²]					95,0	82,4	76,0
lowest individual value [N/mm ²]					93,9		75,1
Variation coefficient [%]					0,5		

Note: Testing was stopped at a breaking load of 2114 kN. The actual strength is higher.

**5. Testing frost resistance of facing bricks and clinker bricks
according to DIN V 52 252-3 / February 2005****5.1 Description of the procedure**

This method simulates the freeze-thaw attack of faced brickwork exposed to outdoors. The visible face of an approx. 0.3 m² test wall made with cement mortar, consisting of full and half bricks, is frozen by blasting with cold air and thawed by warm air and water, alternating, after being immersed in water for 1 week. The freeze-thaw cycles are repeated until the samples show noticeable damage or up to 100 freeze-thaw cycles.

Intensive freezing at the beginning and subsequent temporary thawing creates near-surface stress.

Before starting the test, water absorption of the individual brick samples is determined by 1 day immersion in water.

The frost testing method essentially corresponds with the European method according to CEN / TS 772-Part 22 (Sept. 2006). (Test specimen with mortar joints, 100 freeze-thaw attacks)

5.2 Determining of water absorption

Sample No.:	Weight		Water absorption (1 day immersion in water) DIN V 52 252-3		Water absorption (1 day immersion in water) DIN EN 772-21
	dry m_{tr} [g]	wet m_w [g]	$m_w - m_{tr}$ [g]	[M-%]	[M-%]
1	3284	3355	71	2,2	2
2	3278	3333	55	1,7	2
3	3238	3295	57	1,8	2
4	3245	3297	52	1,6	2
5	3277	3354	77	2,3	2
6	3278	3349	71	2,2	2
7	3249	3326	77	2,4	2
8	3222	3289	67	2,1	2
9	3242	3309	67	2,1	2
10	3285	3365	80	2,4	2
11	3293	3363	70	2,1	-
12	3262	3331	69	2,1	-
13	3281	3326	45	1,4	-
14	3275	3325	50	1,5	-
15	3223	3293	70	2,2	-
16	3257	3336	79	2,4	-
17	3244	3315	71	2,2	-
18	3256	3329	73	2,2	-
Mean				2,1	2

5.3 Result

After 100 freeze-thaw attacks the samples showed no changes such as cracks, chips or flaking. The samples passed the frost test according to DIN V 52 252-3 / February 2005.

**6. Determining initial water absorption according to DIN EN 772-11 / 2011
and DIN EN 771-1 / 2011**

Testing of the clinkers was performed per the test specifications according to DIN EN 772-11 and DIN EN 771-1 Item 5.3.8.

Full bricks were used for testing.

Sample No.:	Dimensions of test surfaces		Weight		Initial Water absorption DIN EN 772-11 [kg / (m ² • min)]
	Length [mm]	Width [mm]	Dry [g]	Wet [g]	
1	215,5	102,5	3251	3255	0,2
2	215,0	104,0	3251	3254	0,1
3	215,5	103,0	3260	3264	0,2
4	215,5	103,0	3272	3275	0,1
5	215,5	103,0	3283	3286	0,1
6	215,5	103,0	3252	3255	0,1
7	216,0	103,0	3279	3283	0,2
8	216,5	104,0	3275	3277	0,1
9	215,5	103,0	3252	3254	0,1
10	215,5	103,0	3230	3233	0,1
Mean:					0,1
Minimum value:					0,1
Maximum value:					0,2

The test mean determined resulted in an initial water absorption of 0,1 kg / (m² • min).

7. Comparing measurements with the requirements according to the specified manufacturer declaration**7.1 Requirements according to EN 771-1**

Property	Requirement		Measurement value	Requirement met
Tolerance class T _m Mean	Length Width Height	+ 4 / -9 mm ± 5 mm ± 3 mm	+ 1 mm 0 mm +2 mm	yes yes yes
Measuring range, Class R _m	Length Width Height	≤ 9 mm ≤ 6 mm ≤ 4 mm	1,5 mm 1,5 mm 1,0 mm	yes yes yes
Dry density Mean deviation	Gross	1995 – 2205 kg/m ³	2193 kg/m ³	yes
	Net	2090 – 2310 kg/m ³	2268 kg/m ³	yes
Water absorption (M-%)	≤ 6 M-%		2 M-%	yes
Initial water absorption	---		0,1 kg / (m ² • min)	--
Freeze-thaw resistance Class F2	100 freeze-thaw attacks without changes		no change	yes
Compressive strength (not standardised)				
Mean strength	≥ 75,0 N/mm ²		95,0 N/mm ²	yes
lowest individual value (80 %)	≥ 60,0 N/mm ²		93,9 N/mm ²	yes

8. Factory production control

The factory production control complies with the requirements of DIN EN 771-1.

9. Overall assessment

The tested properties of the bricks comply with the manufacturer declaration.

Designation:

HD - bricks EN 771-1 T_m R_m D2 F2

Category I, for unprotected brickwork in severe environment

Dimensions: 215 x 102,5 x 65 mm
Gross dry density: 2100 kg/m³
Net dry density: 2200 kg/m³
Compressive strength (not standardised): $\geq$ 75 N/mm²

Head of the laboratory



(p.p. Dipl.-Geol. H. Kreth)



Person responsible



(W. Fischer, Civil Engineer)

Included sorts of clinker places

This test certificate applies to:

HD - bricks EN 771-1 T_m R_m $D2$ $F2$

Category I, for unprotected brickwork in severe environment

Dimensions:	215 x 102,5 x 65 mm
Gross dry density:	2100 kg/m ³
Net dry density:	2200 kg/m ³
Compressive strength (not standardised):	≥ 75 N/mm ²

Factory designation: "British Standard - Potsdam "

With this certificate, proof of quality applies to any bricks of equal production mode and equal format, but different surface color or -structure, since surface color and -structures have no influence on measured values.

The measured values are transferable to:

HD - bricks EN 771-1 T_m R_m $D2$ $F2$

Category I, for unprotected brickwork in severe environment

Dimensions:	215 x 102,5 x 65 mm
Gross dry density:	2100 kg/m ³
Net dry density:	2200 kg/m ³
Compressive strength (not standardised):	≥ 75 N/mm ²

with the company labelling:

- Buchholz / KALAHARI N
- Halle / PEGAZ N
- Cottbus / MAXIMUS
- Wilthen
- Schwarzburg O/WEGA N
- Nevada O/ORION N
- Narsdorf
- Rotenburg
- GOBI N