

MULTIBETON GmbH
Heuserweg 23
Attn: Mr. Björn Harrenberger
53842 Troisdorf

Cologne, 06.03.2026/UG

By e-mail: b.harrenberger@multibeton.de

Project: 0654-002 / Initial Type Test MB Screed Flooring System EFS-40, Moisture Progression, Compressive Strength, Flexural Strength

Test Report No.: 121

1. General

On behalf of Mr. Harrenberger, Multibeton GmbH, IBFS GmbH was commissioned to produce, for the above-mentioned project as part of an initial type test for screed, a sample mix according to a specified mix design and using raw materials provided for this purpose, and to carry out the following tests on it:

1. Production of 3 series of 3 mortar prisms each, measuring 160 × 40 × 40 mm, at test ages of 2, 7, and 28 days, to determine the bulk densities, flexural strengths, and uniaxial compressive strengths of the samples produced, and their classification into a compressive strength class and a flexural strength class.
2. Production of 3 screed slabs approx. 5 cm thick, measuring approx. 50 × 50 cm, to examine the moisture progression in the sample slabs using the CM (calcium carbide) method.
3. Prior non-destructive moisture measurements by the microwave method around the respective test/sampling locations.

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2. Execution

For this purpose, the following raw materials were made available to IBFS GmbH:

- Gravel/sand mix, grain size 0/8 mm
- Portland cement CEM I 42.5 N, manufacturer: WOTAN Üxheim-Ahütte
- MB Screed Emulsion Special (MB-PVP)
- Cold-drawn steel fibers, type KE 20/1.7 from Krampe Harex

From this, on 15.01.2026, a trial mix was produced in the IBFS GmbH laboratory according to the following composition, taken from the product data sheet for the production of 1 m³ of screed:

- 250 kg cement
- 1560 kg sand/gravel
- 20 L MB Screed Emulsion Special
- 40 kg steel fibers

The mix was produced with a water addition of 90 L/m³ in consistency class C1 and scaled to the quantity required for the initial type test. From the mix produced, 3 × 3 mortar prisms measuring 160 × 40 × 40 mm as well as 3 screed sample slabs measuring approx. 50 × 50 × 5 cm were made.

In addition, the actual water/cement ratio of the mix was checked by determining the water content by means of a drying (oven) test on 2 fresh mortar samples with an initial weight of 5000 g each.

The mortar prisms produced were stored covered under laboratory conditions, demolded after approx. 24 hours, and then stored in water at approx. 20°C until testing. The sample slabs were stored under laboratory conditions at 20 ± 2°C and 65 ± 5% relative humidity until the end of testing.

The flexural strength and compressive strength of the mortar prisms were determined at ages of 2, 7, and 28 days, each as the mean value of a series of 3.

The evaluation of the results and classification into compressive strength and flexural strength classes was carried out in accordance with section 5.2.1 and 5.2.2, and Table 2 and Table 3, of DIN EN 13813:2002-10.

On the 3 sample slabs produced, the moisture content was determined at ages of 1, 2, 3, 4, 5, 6, 8, and 11 days. For this purpose, the moisture index was first determined non-destructively by the microwave method at 4 measurement points around the locations selected for CM measurement.

The moisture measurements were carried out using the Moist 300 test device and the Moist-R1M V2 surface measuring head, with a detection depth of up to 3 cm, at the established measurement locations. It should be noted that the moisture index does not represent absolute water content, but serves to compare moisture distribution within one depth layer or between 2 depth layers.

Subsequently, sample material was chiseled out from each of the 3 sample slabs from the full cross-section. The sample material was immediately placed into sealable plastic bags after extraction and reduced in size so that complete pulverization in the CM device was possible using the enclosed steel balls.

After crushing the sample material, it was thoroughly mixed within the plastic bags, and then 20 g of it was weighed out each time and placed into the CM device together with 4 steel balls and one ampoule of calcium carbide. From a test age of 2 days onward, 50 g was weighed out for the tests.

After filling and airtight sealing of the test device, the sample material was further pulverized in the CM device by vigorous shaking for 2 minutes. After a rest period of 3 minutes, the CM device was shaken again for 1 minute. This was followed by a further rest period of 4 minutes. The device was then shaken again for approx. 10 seconds, and the moisture content was read off and recorded on the 20-gram scale, or, from a test age of 2 days onward, on the 50-gram scale.

The remaining material extracted during chiseling was weighed as a composite sample to verify the preceding measurements and dried in an oven at a temperature of 105°C to constant weight, weighed, and the total water content of the samples was determined from this.

3. Results

3.1 Consistency + w/c ratio of fresh mortar

During production of the trial mix on 15.01.2025, a flow/compaction measure of 1.40 was measured.

Using the drying (oven) test, an effective water/cement ratio of 0.46 was determined. The core moisture content of 21 kg/dm³ applied here corresponds to values repeatedly determined, on average, for the aggregates used. Details on the calculation of the w/c ratio can be found in the enclosed protocol.

3.2 Moisture progression

The following table lists the results of the CM measurements carried out on the sample slabs produced, at ages of 1, 2, 3, 4, 5, 6, 8, and 11 days:

Test age [days]	Sample weight per test [g]	Water content in % of sample weight			Mean water content [%]
		Slab 1	Slab 2	Slab 3	
1	20	4.5	4.8	4.7	4.7
2	50	3.2	3.2	3.3	3.2
3	50	2.6	2.9	3.2	2.6
4	50	2.5	2.4	2.8	2.6
5	50	2.6	2.5	2.6	2.6
6	50	2.6	2.5	2.5	2.5
8	50	2.4	2.5	2.2	2.3
11	50	2.3	2.3	2.1	2.2

When comparing the 3 methods used to determine moisture content, the following average values were additionally determined on the 3 slabs examined:

Test age [days]	Mean water content in %		
	CM measurement (calcium carbide)	Microwave method	Drying test (oven, 105°C)
1	4.7	4.5	4.9
2	3.2	3.5	4.2
3	2.9	3.2	3.7
4	2.6	2.8	3.3
5	2.6	2.7	3.0
6	2.5	2.6	2.7
8	2.3	2.4	2.5
11	2.2	2.1	2.1

3.3 Compressive strengths and flexural strengths

The following table lists the mean values of the results of the mortar prisms produced, at test ages of 2, 7, and 28 days.

Test age [d]	Test date	Bulk density [kg/m ³]	Compressive strength [N/mm ²]	Flexural strength [N/mm ²]
2	17.01.2026	2300	21.4	4.72
7	22.01.2026	2350	32.3	6.02
28	12.02.2026	2360	37.6	6.54

The detailed results of the bulk density, compressive strength, and flexural strength tests can be found in the enclosed test certificates.

The fresh-mortar bulk densities determined on the prisms produced, the quantities weighed in during production, the values determined on the fresh mortar and the raw materials, as well as further details on the testing, can be found in the enclosed test request form.

4. Evaluation of results

4.1 Consistency + w/c ratio of fresh mortar

The measured flow/compaction measure of 1.40 corresponds to consistency class C1 and thus to the target consistency range according to the data sheet, i.e., a stiff-plastic consistency customary for the installation of cement screed.

The effective water/cement ratio of 0.46 determined by the drying test likewise complies with the data sheet specifications, whose target range is 0.40 to 0.55.

4.2 Moisture progression

In practice, the temperatures and relative humidity prevailing under laboratory conditions generally cannot be reliably maintained; therefore, the moisture contents listed under section 3.2 for determining the time to reach readiness for covering can serve only as an estimate or a guide value. Accordingly, on-site CM measurements should be carried out in practice to determine readiness for covering.

4.3 Compressive strengths and flexural strengths

Compressive strength classes for screed mortar according to DIN EN 13813:2002, Table 2

Class	C5	C7	C12	C16	C20	C25	C30	C35	C40	C50	C60	C70	C80
Compressive strength in N/mm ²	5	7	12	16	20	25	30	35	40	50	60	70	80

Flexural strength classes for screed mortar according to DIN EN 13813:2002, Table 3

Class	F1	F2	F3	F4	F5	F6	F7	F10	F15	F20	F30	F40	F50
Flexural strength in N/mm ²	1	2	3	4	5	6	7	10	15	20	30	40	50

Considering the results determined at an age of 28 days on the prisms produced — with an average compressive strength of 37.6 N/mm² and an average flexural strength of 6.54 N/mm² — the screed mix produced according to the Multibeton data sheets for the MB Screed Flooring System EFS-40 with Screed Emulsion Special (MB-PVP) can, in accordance with section 7 of DIN EN 13813:2002-10, be classified into class **CT-C35-F6**.

If individual raw materials are changed or replaced, it is recommended that this initial type test be repeated.

The results determined relate to the mix produced and the samples made from it.

For the compilation:

IBFS GmbH

Building Inspection · Concrete Technology · Schönborn

Responsible tester:

Günther

Enclosures:

- Fresh mortar protocol "Test request 170465"
- Test certificate — water/cement ratio (appendix to test request 170465)
- Test certificates — compressive strength, bulk density, and flexural strength after 2, 7, and 28 days (identity test)

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Pierstraße 20 | 50997 Köln
Tel. 0 22 36 / 96 99 77 6

Freiherr-vom-Stein-Str. 2b
59192 Bergkamen



11 170465 0654-002 654

Your reliable partner for perfect concrete

Multibeton
Produktions + Vertriebsges. mbH
Heuserweg 23
53842 Troisdorf

TEST REQUEST

ORDER NO. 170465

Order date: 27.10.2025
Discharge method: Chute
Production date: 15.01.2026

Caller: Björn Harrenberger
Quantity [m³]: 0.0

1. Project / concrete details

Project: 0654-002 / new initial type tests / accompaniment, execution / moisture progression:
Pierstr. 20, Köln-Godorf

Component(s): Initial type test screed

Concrete strength: **CT35-F6** Target consistency: stiff/plastic Recipe no.: Multibeton Supplying plant: Multibeton

Cement type: CEM I 42.5 N Cement content [kg]: 250 FA [kg]: n/a Admixture/other: MB-PVP (20 L/m³)

2. Fresh concrete testing

Weather: sunny Air temperature [°C]: 17.0 Concrete temperature [°C]: 16.0

Identifier	Specimen	Del. note	Time	Consist. a/v [mm]	Wt. fresh concrete [kg]	meas. on	Bulk density [kg/m³]	Air cont. [%]	Age [d]
170465-1-1	Prisms "P"	1	10:43	1	1.78	0	2311	n.d.	2
170465-1-2	Prisms "P"	1	10:46	1	1.81	0	2350	n.d.	7
170465-1-3	Prisms "P"	1	10:50	1	1.80	0	2337	n.d.	28

Visual assessment: crumbly / friable Compaction: —

3. Additional fresh concrete testing

Concrete analysis "W/C": carried out on 15.01.2026 Delivery note: 1

4. Miscellaneous

Sand moisture measured by CM: 2.1%
Water addition: 90 L/m³
Flow/compaction measure: 1.40 (snowball test passed)
Drying test: 341/337 g water per 5 kg
+ 3 test slabs 50×50×5 cm produced
Mix: 11.75 kg cement, 73.3 kg sand, 0.94 L MB-PVP, 1.88 kg fibers, 4.2 L water



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11 170465 0654-002 654

The correct execution of the test is certified.

The correct execution of the test and the accuracy of the
specified waiting time, concrete type, and strength
according to order/planning documents is certified.

15.01.2026
Date Signature – Lab Technician

Signature – Representative of the Recipient

Test Certificate — Water/Cement Ratio (w/c)

BV No.: 0654-002

Appendix to test request: 170465

Test date: 15.01.2026

Delivery note no.	Consistency measure	Weight of concrete	Bulk density	Air void content
1	1.4	1.80	2.34	—

Cement content — metered material quantities per mix

Aggregate type	mm	kg
Sand	0/8	73.30
Sum of aggregate, moist, G1		
Cement, Z1		11.75
Cement, Z2		
Mixing water, W1		4.20
Additive, FA		1.88
Admixture		0.94
Weight of mix, B1		92.1
Volume of mix, $V1 = B1/b$ [dm³]		39.3
Cement content, $Z = 1000 \cdot Z1/V1$ [kg/m³]		299
Additive content, $FA = 1000 \cdot FA1/V1$ [kg/m³]		

Water/cement ratio via drying test

	Sample 1	Sample 2
Fresh concrete weight, B11 [g]	5000	5000
Dry concrete weight, B12 [g]	4659	4663
Water weight in sample, $W1 = B11 - B12$ [g]	341	337
Total water content, $W_{ges} = 1000 \cdot b \cdot W1/B11$ [kg/dm³]	160	158
Core moisture content, W_k [kg/dm³]	21	21
Effective water content, $W = W_{ges} - W_k$ [kg/dm³]	139	137
Mean of samples 1 and 2	138	
Water/cement ratio w/c	0.46	



Identity Test

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Site: 0654-002 / new initial type tests / accompaniment, execution / moisture progression

Component: Initial type test screed

Grade no.: Multibeton CT35-F6

Production date: 15.01.26

Test age: 2d Test date: 17.01.26 Delivery note: n/a

Sample number	170465-1-1-A	170465-1-1-B	170465-1-1-C
Length mm	160.0	160.0	160.0
Width mm	40.0	40.0	40.0
Height mm	40.0	40.0	40.0
Area cm ²	16.00	16.00	16.00
Volume dm ³	0.256	0.256	0.256
Mass kg	0.592	0.595	0.593
Dry bulk density			
Mass, moist kg			
at constant weight kg			
Actual kg/m ³			
Bulk density kg/m ³	2310.000	2320.000	2320.000
Mean: 2320			
Flexural strength — failure load kN	2.02	1.98	2.04
Flexural strength N/mm ²	4.72	4.63	4.79
Mean: 4.72			
Compressive strength — failure load kN	31.5 / 32.6	34.8 / 34.5	34.7 / 37.6
Compressive strength N/mm ²	19.7 / 20.4	21.8 / 21.6	21.7 / 23.5
Mean: 21.4			

Stamp 40.0 × 40.0 mm (area 1600.00 mm²)

Support span: 100.0 mm



Identity Test

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Site: 0654-002 / new initial type tests / accompaniment, execution / moisture progression

Component: Initial type test screed

Grade no.: Multibeton CT35-F6

Production date: 15.01.26

Test age: 7d Test date: 22.01.26 Delivery note: n/a

Sample number	170465-1-2-A	170465-1-2-B	170465-1-2-C
Length mm	160.0	160.0	160.0
Width mm	40.0	40.0	40.0
Height mm	40.0	40.0	40.0
Area cm ²	16.00	16.00	16.00
Volume dm ³	0.256	0.256	0.256
Mass kg	0.606	0.600	0.600
Dry bulk density			
Mass, moist kg			
at constant weight kg			
Actual kg/m ³			
Bulk density kg/m ³	2370.000	2340.000	2340.000
Mean: 2350			
Flexural strength — failure load kN	2.76	2.45	2.49
Flexural strength N/mm ²	6.48	5.75	5.83
Mean: 6.02			
Compressive strength — failure load kN	52.9 / 53.8	48.0 / 50.2	52.4 / 52.8
Compressive strength N/mm ²	33.1 / 33.6	30.0 / 31.4	32.7 / 33.0
Mean: 32.3			

Stamp 40.0 × 40.0 mm (area 1600.00 mm²)

Support span: 100.0 mm



Identity Test

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Site: 0654-002 / new initial type tests / accompaniment, execution / moisture progression

Component: Initial type test screed

Grade no.: Multibeton CT35-F6

Production date: 15.01.26

Test age: 28d Test date: 12.02.26 Delivery note: n/a

Sample number	170465-1-3-A	170465-1-3-B	170465-1-3-C
Length mm	160.0	160.0	160.0
Width mm	40.0	40.0	40.0
Height mm	40.0	40.0	40.0
Area cm ²	16.00	16.00	16.00
Volume dm ³	0.256	0.256	0.256
Mass kg	0.596	0.613	0.602
Dry bulk density			
Mass, moist kg			
at constant weight kg			
Actual kg/m ³			
Bulk density kg/m ³	2330.000	2390.000	2350.000
Mean: 2360			
Flexural strength — failure load kN	3.00	2.71	2.66
Flexural strength N/mm ²	7.04	6.35	6.24
Mean: 6.54			
Compressive strength — failure load kN	63.8 / 60.9	62.4 / 60.6	57.0 / 56.5
Compressive strength N/mm ²	39.9 / 38.0	39.0 / 37.9	35.6 / 35.3
Mean: 37.6			

Stamp 40.0 × 40.0 mm (area 1600.00 mm²)

Support span: 100.0 mm