

Test Report

- Translation -

Document No.: (3162/412/10) – Bie dd. 10/12/2010

Client: Vitrablok s.r.o
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Order date: 26/07/2010

Order Ref.: Mr. Ploch

Order received: 26/07/2010

Subject: An about 80-mm thick "Glass block Q19 Energy saving" glass-block wall made from 190 x 190 x 80 glass blocks to be tested in compliance with DIN EN 1364-1 : 1999-10 in conjunction with DIN EN 1363-1 : 1999-10 to determine its fire resistance time when exposing one side of the specimen to the fire.

Test basis: DIN EN 1364-1 : 1999-10 in conjunction with
DIN EN 1363-1 : 1999-10

Test material received: 12/08/2010

Sampling: Samples taken during production; the Testing Laboratory does not have any information indicating official sampling.

Test material marking: No marking

Test date: 25/08/2010

Valid until: Unlimited



This Test Report consists of 9 pages, including the cover sheet, and 15 annexes.

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Notified body (0761-CPD)
MPA Braunschweig has been approved and notified as a civil engineering supervisory, inspection and certification body. MPA Braunschweig has been ISO/IEC 17025 accredited as a testing and calibration laboratory and ISO/IEC 17020 accredited as an inspection body.

1 General

Under the order placed with the Testing Laboratory, an about 80-mm thick glass-block wall made from 190 x 190 x 80 glass blocks was to be tested for its resistance to fire in compliance with DIN EN 1364-1 : 1999-10 in conjunction with DIN EN 1363-1 : 1999-10 to determine its fire resistance time when one side of the specimen is exposed to the fire. Essential elements of the glazing system were glass blocks and mortar joints.

This Test Report details the test conditions and the results obtained when the specific element of construction described herein was tested in accordance with DIN EN 1364-1 : 1999-10 and DIN EN 1363-1 : 1999-10. Any significant deviation with respect to size, constructional details, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

In view of the special nature of tests conducted to establish the fire resistance time and the difficulties this implies for quantifying any uncertainties in measuring the fire resistance time, a defined degree of accuracy cannot be given for the results established.

The Materials Testing Institute (MPA), Braunschweig was not involved in the selection of the specimen.

2 Description of tested system

2.1 General

The specimen consisted of a total of 196 glass blocks of type "190 x 190 x 80", d = 95 mm thick, on the basis of DIN EN 1051-1 : 2003-04, the mortar joints, and an all-around surround made from heat insulating mortar.

The element had the dimensions 2,960mm wide by 2,960mm high and a weight of approx. 842 kg.

2.2 Structural design of the glass blocks

The 190 x 190 x 80 glass blocks had the dimensions 190 mm x 190 mm x 80 mm. The wall was 7.0 mm thick. The fillet was set back with respect to the edges of the wall, so that a shallow mortar pocket was produced (see annex 1.3).

The coated "Silverstar ENplus" float glass (supplier: EUROGLAS) mounted in the middle of the glass block with "LOXEAL UV 30-22" adhesive (supplier: LOXEAL) was 4 mm thick (see annex 1.3).

2.3 Joints and surround

The mortar used in the joints and the surround was heat insulating "LM 21" mortar.

The joints were approx. 15 mm wide. They were set back by about 3 mm on both sides with respect to the glass surface.

The surround was 55 mm wide and 80 mm thick on all sides.

2.4 Reinforcement

The surround was reinforced with two \varnothing 8 mm reinforcing bars and one \varnothing 6 mm reinforcing bar on each per side, which were made from BSt 500 S (ribbed).

Every horizontal joint was reinforced with two \varnothing 6mm reinforcing bars made from BSt 500 S (ribbed). Every second vertical joint (alternating between inside and outside) was reinforced with one \varnothing 6 m reinforcing bar made from BSt 500 S (ribbed), which extended to the surround reinforcement (see annex 1.2

The reinforcing bars were not tied together with wire at crossing points.

2.5 Transport hooks and element mounting

For ease of transport, two threaded M 12 sleeves were welded at the top to one \varnothing 10mm BSt 500 S reinforcing bar each.

The specimen was connected to the test frame at the top, using 50 mm x 8 mm x 200 mm steel mounting tabs. These were fixed at the top of specimen with two M 10 x 35 mm hexagon screws fitted into the threaded M 12 sleeves. At the test frame end, two S 12 Fischer anchors and two \varnothing 10mm x 100 mm hexagon screws were used (see annex 1.2).

The joint remaining between test frame and wall element was stuffed with mineral wool (building material classification A1). For mounting into the test frame, the specimen was placed on a 10-mm thick strip of mineral wool (non-flammable; melting point \geq 1000 °C).

For further details of the element, reference is made to annexes 1.1 to 1.3 of this Test Report.

3 Specimen and building material characteristics

At the time of testing, the strength and the moisture content of the specimen corresponded by approximation to what can be expected under normal conditions in practice.

The tested system, and the construction materials used for the system, are in compliance with the details listed in the table in annex 1.4 regarding material classification, weight per unit area, apparent density and moisture content.

4 Test set-up and testing

The client's own staff installed the specimen described in section 2 above as a wall element supported on two sides into the clear opening of a wall test facility so that it formed a vertical barrier.

The approx. 25-mm wide gap between test frame and specimen on the free vertical lateral ends was filled with mineral wool (non-flammable, melting point ≥ 1000 °C).

The heating regime in the furnace conformed with the standard temperature-time curve (ETK) of DIN EN 1363-1 : 1999-10, section 5.1.1. The temperatures in the furnace were measured with 6 plate thermometers in compliance with DIN EN 1363-1 : 1999-10, section 4.5.1.1. Their position corresponded with the specifications in DIN EN 1364-1 : 1999-10.

The furnace pressure was measured in compliance with the specifications made in DIN EN 1363-1 : 1999-10. The furnace pressure graph is shown in annex 2.8.

The temperatures on the face of the specimen not exposed to the fire were measured with thermocouples that complied with DIN EN 1363-1 : 1999-10, section 4.5.1.2.

The position of the measuring points is shown in annex 1.1 of this Test Report.

In accordance with DIN EN 1364-1 : 1999-10, section 9.3, the horizontal deflection of the specimen was measured in the middle of the tested wall and 50 mm from the free edge. Results are shown in annex 2.6. Another two measuring points were arranged as shown in annex 1.1.

5 Test results and observations

The temperature rise above the initial temperature established during the fire test on the non-exposed face of the specimen, the temperatures in the furnace, the differential pressure, evaluation of the error integral, the ambient temperature, the deflection of the specimen, and radiation measurements are shown in the graphs in annexes 2.1 to 2.9.

The observations made during the fire test are listed in annex 2.10.

6 Test results summarised and performance criteria

On 25 August 2010, an about 80-mm thick glass-block wall made from 190 x 190 x 80 glass blocks was tested to determine its fire resistance time when exposing one side of the specimen to the fire.

For a summary of the test results and performance criteria according to DIN EN 1364-1 : 1999-10 in conjunction with DIN EN 1363-1 : 1999-10 for non-load-bearing, separating walls that are exposed to a fire on one side, reference is made to table 1 of this Test Report.

(Table 1: see next page)

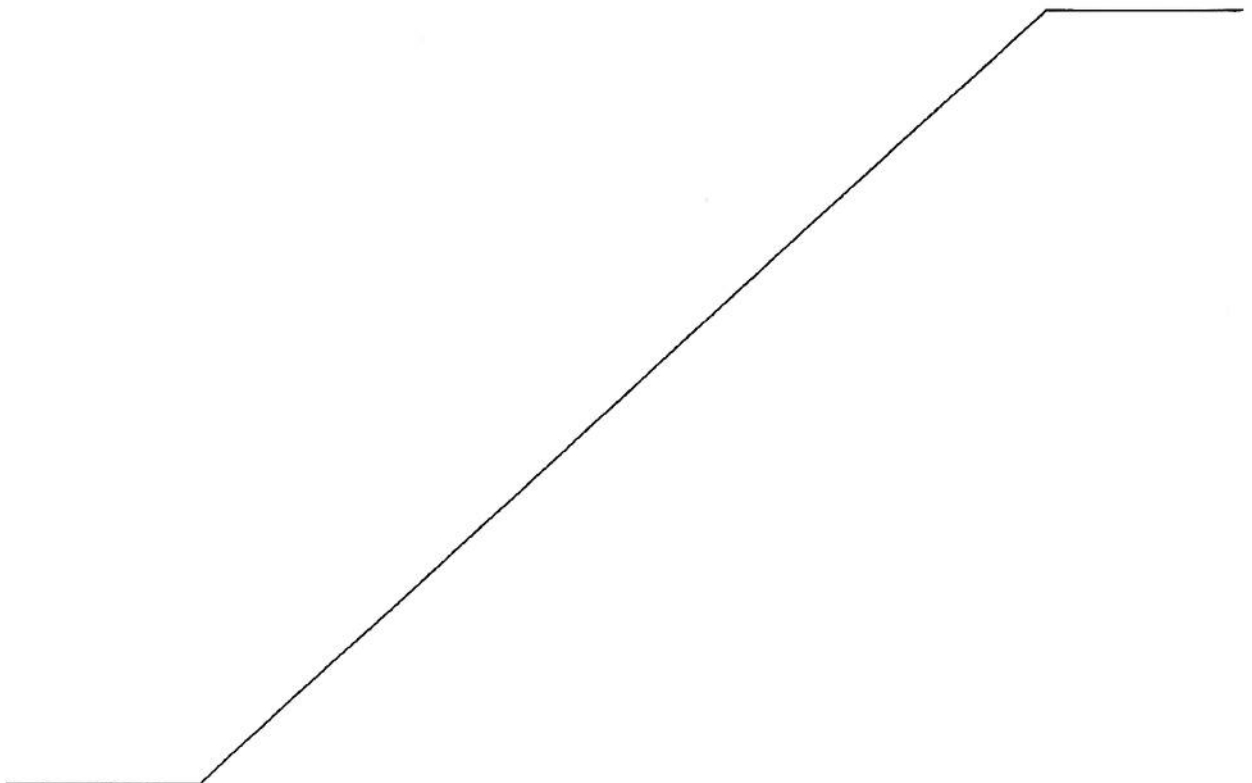


Table 1: Test results and performance criteria in accordance with DIN EN 1364-1 : 1999-10, in conjunction with DIN EN 1363-1 : 1999-10 for non-loadbearing, separating walls, when one of their sides is exposed to the fire

Line	Cross reference with Standard Details based on DIN EN 1363-1 : 1999-10 Section	Requirements		Test results			
				Particulars		Specimen supported on two sides	
1	11.1	<u>Load bearing capacity</u>	Limit value of vertical compressive strain	Limit value exceeded after:		_2)	
2			Limit value of vertical compression rate	Limit value exceeded after:		_2)	
3	11.2	<u>Integrity</u> i.e. prevention of	Ignition of cotton pad	Cotton pad ignited after:		- min.	
4			Occurrence of gaps	Gap gauge could be inserted after:		- min.	
5			Flames on non-exposed face	Sustained flaming occurred after:		- min.	
6	11.3	<u>Thermal insulation</u> , i.e. temperature rise on the non-exposed face beyond initial temperature:		Test period in minutes	19	25	56
7		Max. adm. mean value $\Delta T = 140$ K		Max. temperature rise noted: <u>mean value</u> in K	75	140	386
8		Max. adm. individual value $\Delta T = 180$ K		Max. temperature rise noted: <u>individual value</u> in K:	180 [Meas.p. 2]	361 [Meas.p. 2]	456 [Meas.p. 18]
9	5.6	Other particulars		Ambient temperature when starting the test in the laboratory:	21 °C		
10				The ambient temperature rose/dropped during the test by max.	< 2 K		
11	5.2.2.1			Pressure in the furnace	see annex 2.8		
12	10.4.4			Test period in minutes	20	25	55
13				Deflection in middle of wall	76 mm	82 mm	127 mm
14				Deflection at unsupported edge in [mm] (defl. point: A/C)	19/31	19/30	20/56

1) Not tested as there was no need to include this aspect

2) Not subject matter of the test.

7 Conclusions based on DIN EN 1364-1 : 1999-10 in conjunction with DIN EN 1363-1 : 1999-10, and recommendations

The table below lists essential test results regarding the performance criteria of DIN EN 1364-1 : 1999-10 in conjunction with DIN EN 1363-1 : 1999-10.

Table 2: Performance criteria in accordance with DIN EN 1364-1 : 1999-10, in conjunction with DIN EN 1363-1 : 1999-10 for non-loadbearing, separating walls, when one of their sides is exposed to the fire

	Criteria according to standard	Failure after [minutes]:
E	Integrity (sustained flaming, gap gauge)	55
I	Thermal insulation	19

In view of the results (see tables 1 and 2) produced during the test period between the beginning of fire exposure and the point of failure, the tested wall system can with respect to the criteria integrity and thermal insulation be recommended to be classified under fire resistance class **E 30** in accordance with classification standard DIN EN 13 501-2 : 2008-01, when one side of the system is exposed to the fire.


8 Field of direct application in accordance with DIN EN 1364-1 : 1999-10, section 13

8.1 General


The results produced in the fire test may be directly transferred to similar designs which are subjected to one or a number of the modifications listed below, and whose design regarding stiffness and strength continues to comply with the requirements of the relevant design standard.

Field of direct application in compliance with the standard		Design is
a)	Reduced glass block dimensions	Accepted
b)	Variation of the glass block side ratios, provided the largest dimension of the glass blocks and their surface remain unchanged	Accepted
c)	Reduced distance between mullions and transoms	Does not apply
d)	Reduced distance between fixing points	Accepted
e)	Larger frame element dimensions	Does not apply
f)	Screwed glazing supports, if the specimen incorporated click-on glazing support edges	Does not apply
g)	Expansion allowance, if this was not incorporated in the specimen	Does not apply
h)	Modified installation angle of up to 10° from the vertical line	Accepted
Height increased beyond the tested height		Not accepted
An identical design may be increased in width, if the specimen was (at a minimum nominal width of 3.0m) tested with a free vertical edge.		Not accepted

This document is the translated version of Test Report 3162/412/10 – Bie dated 10/12/2010. The legally binding text is the aforementioned German Test Report.


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