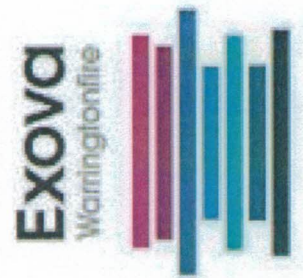


Exova Warringtonfire
Holmesfield Road
Warrington
WA1 2DS
United Kingdom

T : +44 (0) 1925 655 116
F : +44 (0) 1925 655 419
E : warrington@exova.com
W: www.exova.com



Testing. Advising. Assuring.

Title:

The Fire Resistance
Performance of a Non-
Loadbearing Partition Wall
Assembly

WF Report No:

194213 Issue 4

Prepared for:
VG-ORTH GmbH & Co. KG
Holeburgweg 24
37627 Stadtoldendorf
Germany

Date: 14th June 2010

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Executive Summary

Objective	This report presents a considered opinion regarding the expected fire resistance performance of a non-loadbearing partition wall assembly as previously tested to DIN 4102-2:1977-09, at iBMB: MPA Braunschweig, Germany, should the assembly be tested in accordance with BS 476: Part 22: 1987, Clause 5.
Report Sponsor	VG-ORTH GmbH & Co. KG
Address	Holeburgweg 24 37627 Stadtoldendorf Germany
Summary of Conclusions	It can be concluded that the proposed partition wall assembly should be capable of providing 120 or 240 minutes integrity and insulation performance (dependent upon thickness), if subjected to a fire resistance test in accordance with Clause 5 of BS 476: Part 22: 1987.
Valid until	1 st May 2023

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Introduction

This report presents an appraisal of the fire resistance performance of a partition wall assembly which is formed from interlocking gypsum based blocks when tested in accordance with BS 476: Part 22: 1987, Clause 5.

The proposed wall assembly, which is fully described in test Report No. 3610/6108 from iBMB: MPA Braunschweig and summarised in the Proposals section of this report, is required to provide 120 or 240 minutes integrity and insulation performance (depending on block specification) if subjected to a fire resistance test in accordance with Clause 5 of BS 476:Part 22: 1987.

FTSG

The data referred to in the supporting data section has been considered for the purpose of this appraisal which has been prepared in accordance with the Fire Test Study Group Resolution No. 82: 2001.

Assumptions

General Construction

The non-loadbearing partition wall assembly is assumed to be identical to that subjected to the test referenced No. 3610/6108 at iBMB: MPA Braunschweig, Germany unless discussed in this report.

Installation

It is assumed that the partition wall will be installed in a similar manner to that of the previously tested assembly by competent installers.

Supporting construction

It is assumed that the wall assembly shall be installed onto a supporting construction, which is capable of supporting the wall with a fire resistance related to loadbearing capacity when tested in accordance with BS 476: Part 21: 1987 of at least 240 minutes.

Proposals

The iBMB: MPA Braunschweig test report referenced No. 3610/6108 describes a fire resistance test performed on a partition wall assembly following DIN 4102-2.

It is required that the abovementioned document gives sufficient confidence in the described partition wall to meet the fire resistance criteria for 240 minutes integrity and insulation, with respect to Clause 5 of BS 476: Part 22: 1987.

It is further required that the tested partition wall, when reduced in overall thickness to 80 mm, provides 120 minutes integrity and insulation performance.

It is also required that the abovementioned partition walls, when constructed with a higher density blocks, will at least have the same performance relating to fire resistance.

It is also proposed that a hydrophobized version of blocks can be used in the partitions. Hydrophobized blocks are blocks which are treated with less than 1% silicone to make them less sensitive to water and make them suitable for use in humid conditions.

It is further proposed that MultiGips D100-R48 radiation protection blocks may be assessed under the scope of this report. The fire resistance performance of walls constructed using these blocks is limited to 120 minutes Integrity and Insulation with respect to BS 476: Part 22: 1987.

Basic Test Evidence

Report No.
3610/6108 of
iBMB: MPA
Braunschweig,
Germany

A fire resistance test performed on a specimen of a non-loadbearing partition wall assembly which had overall nominal dimensions of 3000 mm high by 3000 mm wide by 100 mm thick.

The partition wall assembly was formed from interlocking gypsum based blocks of nominal dimensions 500 mm high by 666 mm wide. The blocks were of medium density (900 kg/m^3). The blocks were jointed using a gypsum plaster based mortar. The tested assembly also incorporated two electrical sockets in the upper row of blocks, one on each face of the panel. The socket recesses were nominally 40 mm deep.

Test Results:

Integrity 250 minutes no failure

Insulation 250 minutes no failure

The test was discontinued after a period of 250 minutes.

Test Date : 19th June 1998

Test Sponsor : The test was conducted on behalf of another manufacturer using blocks as stated to be manufactured by VG-ORTH GmbH & Co. KG.

The test was witnessed by Mr. C. Keeley, a representative of **Exova Warringtonfire**.

Assessed Performance

Comparing DIN 4102-2 test method to BS 476-Part 22:1987

The DIN 4102-2 test method uses a time-temperature profile based on the ISO 834 test standard, which is the same basis as defined in the BS 476-20. The only difference between the two methods of calculating the furnace temperature is that the BS test method assumes an initial furnace temperature of 20°C, whereas the DIN 4102-2 method incorporates the actual temperature recorded in the furnace prior to the test.

When considering the temperatures to which the specimen will be subjected and the tolerances given for the control of furnace temperature the difference between the two methods is considered insignificant. The temperature exposure of the specimen can therefore be assumed to be equivalent in both test methods.

The BS 476-20 specifies that there should be an overpressure in the furnace, with the neutral plane at 1.00 m high and a gradient of 8.5 Pa/m. The DIN 4102-2 test method requires that a positive pressure of 10 (± 2) Pa, relative to the laboratory atmosphere, is maintained at three quarters height of the specimen. This equates to 17.5 (± 2) Pa at the head of the specimen, which conforms to the gradient specified in the BS 476:20

The pressure conditions of the furnace during the testing of the partition can therefore be assumed to be compliant with the requirements of the BS 476:20

Integrity and insulation performance of the partition

The partition assembly tested under the reference Report No. 3610/6108 of iBMB: MPA Braunschweig achieved an integrity and insulation of 250 minutes after which time the test was terminated.

The maximum temperature recorded on the unexposed face of the tested specimen after 240 minutes of testing was 92°C. The mean surface temperature was approximately 75°C.

This gives confidence in the ability of the partition assembly to be able to provide 240 minutes integrity and insulation performance with regards to BS 476: Part 22: 1987.

Specific Criteria for Partition Walls

Although both test standards are similar with regard to the evaluation of partition walls it is noted that the German test standard requires an impact test to be performed on the specimen 3 minutes before the end of the required test period, in this case 237 minutes.

As the impact test could dislodge a weakened construction, which may otherwise remain in position, it is considered that the German test represents a more onerous condition.

80 mm Thick Partitions

It is proposed to provide an 80 mm thick partition of a similar construction to the 100 mm thick tested partition wall to provide 120 minutes integrity and insulation performance.

The tested partition was of 100 mm thickness and provided 250 minutes integrity and insulation performance. The proposed 80 mm partition represents 80% of the tested thickness to provide 48% of the achieved integrity and insulation performance.

A letter produced by iBMB states that a post test examination of the specimen indicated that approximately 60 to 80 mm of gypsum material had degraded, leaving 20 to 40 mm of gypsum panels still in a stable condition.

The impact test did not dislodge any portion of the specimen and therefore it can be used to demonstrate the stability of a thinner structure under the British Standard test conditions.

As the proposed 20% reduced panel thickness is only required to provide 48% of the achieved integrity performance it is considered, based on the comments above, that the use of an 80 mm thick partition to provide 120 minutes integrity performance is acceptable.

The maximum temperature recorded on the unexposed face of the tested specimen after 240 minutes of testing was 92°C. The mean surface temperature was approximately 75°C.

The tested assembly also incorporated two electrical sockets in the upper row of blocks, one on each face of the specimen. The socket recesses were nominally 40 mm deep. Temperature data within the report, from thermocouples fixed to the recess indicates that the maximum temperature rise was exceeded after a period of 214 minutes on an effectively 60 mm thick section of panel.

Based on the comments above it is considered reasonable to expect an 80 mm thick construction to provide the required 120 minutes insulation performance.

Nominal density of the blocks

The blocks are made in compliance with the EN 12859 *Gypsum blocks - Definitions, requirements and test methods* and are classed as "medium density" blocks. For these blocks a density range of 800 – 1100 kg/m³ is defined. It is considered that when the blocks are in this density range the required fire resistance performance will be achieved.

Higher density blocks

An increase in density from 900 kg/m³ to 1200 kg/m³, or 1400 kg/m³, is expected to provide increased strength and rigidity.

Considering the microcellular nature of the product (the density of solid gypsum is 2300 kg/m³) this increase in density is not expected during a fire test to result in destructive phenomena like spalling as can be observed in some high density solid concrete materials.

Considering the microcellular nature of the product the amount of both crystalline water and absorbed water in equilibrium will be higher in the higher density blocks. It is therefore expected that the fire resistance performance regarding insulation will at least be as good as that of the lower density blocks.

It is therefore expected that a partition constructed from blocks with a density of 1200 kg/m^3 , or 1400 kg/m^3 , will have at least an equal fire resistance performance compared to a similar partition constructed from blocks with a density of 900 kg/m^3

This conclusion is further supported by Table 1 in the product standard EN 12859 *Gypsum blocks - Definitions, requirements and test methods* where thermal conductivity values given for higher density blocks are similarly low to those given for medium density blocks.

Hydrophobized blocks

Hydrophobized blocks are formulated with less than 1% silicone additives to give them a certain degree of water repellent properties, for use in humid and wet conditions. It is considered that the addition of $\leq 1\%$ of silicone additives will not have an adverse effect on the fire resistance properties of the partitions constructed from these blocks.

MultiGips D100-R48 radiation protection

It is proposed that walls may be constructed using 'MultiGips D100-R48 radiation protection blocks'. These blocks are used for constructing non-loadbearing walls for X-ray diagnostics or radiotherapy rooms. The blocks are produced using 20-40% barite fillers and have dimensions of $500 \times 400 \times 100 \text{ mm}$ thick, density of 1400 kg/m^3 and are coloured violet/reddish brown for identification purposes.

The density of the blocks, being 1400 kg/m^3 , are classified as high density blocks in accordance with EN 12859. A discussion related to increased density blocks has already been provided earlier in this report and the conclusions given are considered valid for this particular design option.

Section 3.1.1 of EN 12859 states that gypsum blocks may produced from calcium sulphate and water, that may incorporate fibers, fillers, aggregates and other additives as far as they are not classified as dangerous substances in accordance with European regulations, and that may be coloured by pigmentation in accordance with the provisions of this standard. In this case the barite is considered a filler and so is an acceptable option with regards to the definition described within the standard.

The use of the barite and pigmentation additives are therefore considered acceptable to allow the scope of the proposed block to remain as covered within EN 12859.

In terms of the expected affect on fire resistance performance, it has already been established by test that blocks of 100 mm thickness (at 900kg/m³ density) are capable of providing over 240 minutes integrity and insulation performance. The proposed block remain at a thickness of 100 mm but have an increased density of 1400kg/m³.

This increase in density and the use of the barite filler may adversely affect the thermal conductivity. However, based on the fact that the unexposed surface temperature of the tested blocks after 240 minutes of testing was 92°C and the mean surface temperature was approximately 75°C. The low temperature experienced on the surface of the tested blocks, combined with the fact that the fire resistance performance of the proposed radiation protection blocks is more than halved, from 250 minutes, as achieved in test, to 120 minutes, is expected to offset any deleterious affects induced by the change in density and addition of fillers.

The proposed blocks are therefore positively appraised for a fire resistance performance of 120 minutes integrity and insulation with respect to BS 476: Part 22: 1987.

Conclusions

The non-loadbearing partition wall assembly as previously tested to DIN 4102-2: 1977-09, at iBMB: MPA Braunschweig, Germany, under the reference No. 3610/6108, is expected to be capable of providing 240 minutes integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

In addition it is considered that should the overall thickness of the construction be reduced to 80 mm, it would be expected to be capable of providing 120 minutes integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

It is considered that blocks of "medium density" (800 – 1100 kg/m³) will achieve similar results when if tested in accordance with BS 476: Part 22: 1987, Clause 5.

In addition it is considered that should the density of the gypsum blocks of the construction be increased to 1200 kg/m³, or 1400 kg/m³, it would be expected to be capable of providing at least an equal integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

It is also considered that "hydrophobized" blocks, which are formulated with ≤1% of silicone additives will achieve the same results if tested in accordance with BS 476: Part 22: 1987, Clause 5.

It is also considered that MultiGips D100-R48 radiation protection blocks, which are formulated with barite additives will achieve 120 minutes Integrity and Insulation performance if tested in accordance with BS 476: Part 22: 1987, Clause 5.

Review

It has been confirmed by VG-ORTH GmbH & Co. KG that there have been no changes to the specification, materials or constructional details of the products considered in the original appraisal.

The data used for the original appraisal has been re-examined and found to be satisfactory. The procedures adopted for the original assessment have also been re-examined and are similar to those currently in use.

Therefore, with respect to the assessment of performance given in WF Assessment Report No. 194213 Issue 3, the contents should remain valid for a further 5 years.

This review is based on information used to formulate the original assessment. No other information or data has been provided by VG-ORTH GmbH & Co. KG which could affect this review.

The original appraisal report was performed in accordance with the principles of the UK Fire Test Study Group Resolution 82: 2001. This review has therefore also been conducted using the principles of Resolution 82: 2001.

Validity

This assessment is issued on the basis of test data and information available at the time of issue. If contradictory evidence becomes available to **Exova Warringtonfire** the assessment will be unconditionally withdrawn and **VG-ORTH GmbH & Co. KG** will be notified in writing. Similarly the assessment is invalidated if the assessed construction is subsequently tested because actual test data is deemed to take precedence over an expressed opinion. The assessment is valid initially for a period of five years i.e. until 1st May 2023, after which time it is recommended that it be returned for re-appraisal.

The appraisal is only valid provided that no other modifications are made to the tested construction other than those described in this report.

Declaration by VG-ORTH GmbH & Co. KG

We the undersigned confirm that we have read and complied with the obligations placed on us by the UK Fire Test Study Group Resolution No. 82: 2001.

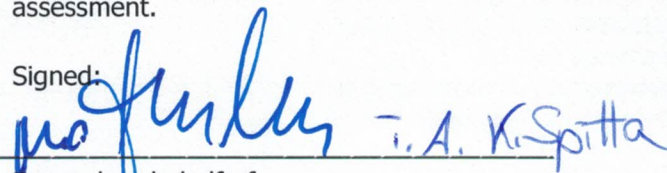
We confirm that the component or element of structure, which is the subject of this assessment, has not to our knowledge been subjected to a fire test to the Standard against which the assessment is being made.

We agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test to the Standard against which this assessment is being made.

We are not aware of any information that could adversely affect the conclusions of this assessment.

If we subsequently become aware of any such information we agree to cease using the assessment and ask **Exova Warringtonfire** to withdraw the assessment.

Signed:

 T. A. K. Spitta

For and on behalf of:

VG-ORTH GmbH & Co. KG

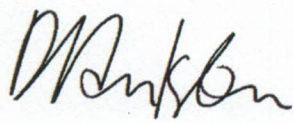
Ruf (05532) 505-0 · Fax (05532) 505-550

Holeburgweg 24 · 37627 Stadtoldendorf

Postfach 12 80 · 37624 Stadtoldendorf

Signatories


Responsible Officer A Kearns* - Technical Manager


Approved D. Hankinson* - Principal Certification Engineer

* For and on behalf of **Exova Warringtonfire**

Report Issued: 14 th June 2010

The assessment report is not valid unless it incorporates the declaration duly signed by the applicant.

Issue 2 is prepared on 29th October 2015 to include an evaluation of blocks of 1400 kg/m³ nominal density in addition to blocks of 1200 kg/m³ nominal density.

Issue 3 is prepared on 10th August 2016 to include an evaluation of hydrophobized blocks and the density range of "medium density" blocks.

Issue 4 is prepared on 26th April 2018 to include an evaluation of MultiGips D100-R48 radiation protection blocks.

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