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**Title:**

The Fire Resistance  
Performance of Modified  
'Magboard' Partition Wall  
Assemblies in Accordance  
with BS 476: Part 22: 1987

**WF Assessment Report  
No:**

326521

**Date:**

25<sup>th</sup> February 2013

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## Executive Summary

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<b>Objective</b>	This report presents an appraisal of the fire resistance performance of non-loadbearing partition assemblies, incorporating timber and steel studs faced with Magboard and insulated with mineral fibre slab, if tested in accordance with BS 476: Part 22: 1987, Clause 5.
<b>Summary of Conclusions</b>	Should the recommendations given in this report be followed, it can be concluded that the non-loadbearing partition assemblies, as detailed within this report, should provide either 30 minutes or 60 minutes (depending upon specification) integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.
<b>Valid until</b>	1 <sup>st</sup> March 2018

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## Introduction

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This report presents an appraisal of the fire resistance performance of non-loadbearing partition assemblies, incorporating timber and steel studs faced with Magboard and insulated with mineral fibre slab, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

The proposed walls are required to provide a fire resistance performance of 30 or 60 minutes integrity and insulation performance, with respect to BS 476: Part 22: 1987, Clause 5, depending on Magboard facing board specification.

### 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

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### Supporting construction

It is assumed that the construction, which supports the proposed partition assembly, will have been the subject of a separate test and its performance is such that it will not influence the performance of the partition for the required period.

### Wall Construction

It is also assumed that the partition assembly will be fixed back to a supporting structure having a fire performance at least equal to that required by the partition. The structure shall be capable of providing adequate support and restraint to the partition over such a period.

## Proposals

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### 60 Minute Partition Using Timber Studs

It is proposed that a partition assembly, previously tested under the reference WF Test Report No. 188642, when modified to incorporate timber studs, rather than steel studs as tested, should provide 60 minutes integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

The specification of the proposed wall will be as follows:

- Timber studs, 50x70mm
- 65 mm thick Rockwool RW4 slabs, 80kg/m<sup>3</sup> density (may be from two layers 25 mm and 40 mm)
- 9 mm thick Magboard's screw fixed to each face of stud

### **30 Minute Partition Using Timber Studs**

It is proposed that a partition assembly, previously tested under the reference WF Test Report No. 188642, when modified to incorporate timber studs and the use of thinner 6 mm Magboard facings, rather than steel studs and 9 mm boards as tested, should provide a reduced performance of 30 minutes integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

The specification of the proposed wall will be as follows:

- Timber studs, 50x70mm
- 65 mm thick Rockwool RW4 slabs, 80kg/m<sup>3</sup> density (may be from two layers 25 mm and 40 mm)
- 6 mm thick Magboard's screw fixed to each face of stud

### **30 Minute Partition Using Steel Studs**

It is proposed that a partition assembly, previously tested under the reference WF Test Report No. 188642, when modified to incorporate steel studs and the use of thinner 6 mm Magboard facings, rather than steel studs and 9 mm boards as tested, should provide a reduced performance of 30 minutes integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.

The specification of the proposed wall will be as follows:

- Steel studs, 72x24x0.5 mm head and base channels, 70x32x0.5 mm vertical studs (details as tested in WF Report No. 188642)
- 65 mm thick Rockwool RW4 slabs, 80kg/m<sup>3</sup> density (may be from two layers 25 mm and 40 mm)
- 6 mm thick Magboard's screw fixed to each face of stud

## **Basic Test Evidence**

### **WF Test Report No. 188642**

To determine the fire resistance performance of a non-loadbearing partition wall assembly when tested in accordance with BS 476: Part 22: 1987.

The partition had overall nominal dimensions of 3035 mm high by 3000 mm wide by 88 mm thick. The framing comprised 70 mm by 32 mm by 0.5 mm thick galvanised mild steel 'C' stud, at maximum 600 mm centres, friction fitted into 72 mm by 24 mm by 0.5 mm 'U' section head and base channels. Each side of the stud frame was faced with a single layer of 9 mm thick Magnesium Oxide board referenced 'Magboard'. The boards were screw fixed in place using 32 mm long, drywall screws, at nominally 300 mm centres.

The cavity of the partition included two layers of nominally 40 mm thick (fireside) and 25 mm thick (non-fireside) 'Rock fibre slab' insulation of a stated density 80Kg/m<sup>2</sup>

#### Test Results:

Integrity 71 minutes

Insulation 71 minutes

The test was discontinued after a period of 71 minutes.

## Assessed Performance

The partition tested under the reference WF Test Report No. 188642 comprised a partition assembly incorporating 70 mm steel studs faced with 9 mm Magboard and with the cavity filled with 65 mm of Rockwool RW4 insulation having a density of 80kg/m<sup>3</sup>. The wall assembly achieved a fire resistance performance of 71 minutes when tested in accordance with BS 476: Part 22: 1987.

The proposals discussed within this report relate to the performance of a 60 minute wall system where the modification involves the use of timber studs in lieu of the steel studs as tested, but retaining all other component specifications, and also the performance of 30 minute wall systems, where both timber and steel stud options are utilised together with a reduction in board thickness from 9 mm, as tested, to 6 mm. In all proposed walls systems, the use of the 65 mm thick Rockwool RW4, 80kg/m<sup>3</sup> will be retained. Each proposed option will be discussed separately in the following sections to this report.

### 60 Minute Partition Using Timber Studs

The wall tested under the reference WF188642 incorporated steel studs. It is proposed that timber studs, 70 mm by 50 mm may be used as an alternative without compromising the required 60 minutes fire resistance performance.

Empirical test evidence and extensive testing experience has shown that timber stud walls are more dimensionally stable under fire test conditions than steel stud walls, due to the fact that timber does not experience the same amount of thermal expansion (and therefore distortion) as steel. The fact that expected deflections will be less when utilising timber studs has the benefit that the unexposed board layer will be subjected to smaller deflection, thus the potential for board cracking is less likely and the overall performance of the board may improve.

In addition, the higher level of thermal insulation offered by the insulative timber stud will minimise thermal transfer through the wall at the stud position ensure that the performance of the wall in terms of insulation performance is likely to improve. The insulative function of the timber stud, compared to the steel stud, will also minimise heat transfer through the screws into the unexposed board layer(s) which should help provide enhanced fixity.

Further confidence in the proposal is offered by the fact that the tested 60 minute wall achieved fire resistance performance significantly in excess of that required, i.e. the 60 minute wall achieved 71 minutes integrity and insulation performance (an 18% overrun). This level of performance and the achieved integrity overruns may also be used to further justify the modifications proposed and gives confidence that the modified timber stud walls would satisfy the integrity and insulation criteria of a test conducted in accordance with BS 476: Part 22: 1987, for the required 60 minute period. The proposal is therefore positively appraised.

### **30 Minute Partition Using Steel Studs**

The wall tested under the reference WF188642 incorporated steel studs protected with one layer of 9 mm thick Magboard to each side. It is proposed that the wall may be modified such that the studs are protected with a reduced thickness of Magboard to each side i.e. 6 mm thick for a reduced fire resistance performance of 30 minutes. All other component and design specifications will remain as tested.

The modification involves a reduction in board facings from 9 mm, as tested, to 6 mm which equates to a reduction in thickness of board by 33%. However, the wall considered with this board specification requires a fire resistance of only 30 minutes compared to the 71 minutes achieved by the tested wall (incorporating the 9 mm boards), which equates to a reduction in performance compared to that achieved of approx. 57% which provide a good degree of confidence in the proposed wall specification's performance.

Observations, deflections and temperature measurements taken during the test WF188642, indicate that the tested partition remained free of significant deflections/distortions up to 30 minutes, with an average temperature rise measured on the unexposed surface at a test duration of 30 mins being only 58°C, significantly below the failure criteria for insulation. Indeed, the unexposed average temperature after a test duration of 71 minutes was only 119°C, again significantly under failure temperature. This provides confidence in the proposal to decrease the board thickness by the proposed amount.

Additionally, the fact that the wall will continue to incorporate the 65 mm thick, 80kg/m<sup>3</sup> RW4 slab insulation, i.e. the specification used in the 60 minute tested wall, provides confidence that even if early loss of the thinner 6 mm boards occur, protection is given to the studs and the unexposed boards.

### **30 Minute Partition Using Timber Studs**

The wall tested under the reference WF188642 incorporated steel studs protected with one layer of 9 mm thick Magboard to each side. It is proposed that timber studs, 70 mm by 50 mm may be used as an alternative, protected with a reduced thickness of Magboard to each side i.e. 6 mm thick for a reduced fire resistance performance of 30 minutes.

The modification involves a reduction in board facings from 9 mm, as tested, to 6 mm which equates to a reduction in thickness of board by 33%. However, the wall considered with this board specification requires a fire resistance of only 30 minutes compared to the 71 minutes achieved by the tested wall (incorporating the 9 mm boards), which equates to a reduction in performance compared to that achieved of approx. 57% which provide a good degree of confidence in the proposed wall specification's performance.

Observations, deflections and temperature measurements taken during the test WF188642, indicate that the tested partition remained free of significant deflections/distortions up to 30 minutes, with an average temperature rise measured on the unexposed surface at a test duration of 30 mins being only 58°C, significantly below the failure criteria for insulation. Indeed, the unexposed average temperature after a test duration of 71 minutes was only 119°C, again significantly under failure temperature. This provides confidence in the proposal to decrease the board thickness by the proposed amount.

Additionally, the fact that the wall will continue to incorporate the 65 mm thick, 80kg/m<sup>3</sup> RW4 slab insulation, i.e. the specification used in the 60 minute tested wall, provides confidence that even if early loss of the thinner 6 mm boards occur, protection is given to the studs and the unexposed boards.

Empirical test evidence and extensive testing experience has shown that timber stud walls are more dimensionally stable under fire test conditions than steel stud walls, due to the fact that timber does not experience the same amount of thermal expansion (and therefore distortion) as steel. The fact that expected deflections will be less when utilising timber studs has the benefit that the unexposed board layer will be subjected to smaller deflection, thus the potential for board cracking is less likely and the overall performance of the board may improve.

In addition, the higher level of thermal insulation offered by the insulative timber stud will minimise thermal transfer through the wall at the stud position ensure that the performance of the wall in terms of insulation performance is likely to improve. The insulative function of the timber stud, compared to the steel stud, will also minimise heat transfer through the screws into the unexposed board layer(s) which should help provide enhanced fixity. The proposal to utilise timber studs in lieu of steel studs is therefore positively appraised.

## Conclusions

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Should the recommendations given in this report be followed, it can be concluded that the non-loadbearing partition assemblies, as detailed within this report, should provide either 30 minutes or 60 minutes (depending upon specification) integrity and insulation performance, if tested in accordance with BS 476: Part 22: 1987, Clause 5.



## 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 Magboard Benelux 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 1<sup>st</sup> March 2018, 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.

## Summary of Primary Supporting Data

### WF Test Report No. 188642

To determine the fire resistance performance of a non-loadbearing partition wall assembly when tested in accordance with BS 476: Part 22: 1987.

The partition had overall nominal dimensions of 3035 mm high by 3000 mm wide by 88 mm thick. The framing comprised 70 mm by 32 mm by 0.5 mm thick galvanised mild steel 'C' stud, at maximum 600 mm centres, friction fitted into 72 mm by 24 mm by 0.5 mm 'U' section head and base channels. Each side of the stud frame was faced with a single layer of 9 mm thick Magnesium Oxide board referenced 'Magboard'. The boards were screw fixed in place using 32 mm long, drywall screws, at nominally 300 mm centres.

The cavity of the partition included two layers of nominally 40 mm thick (fireside) and 25 mm thick (non-fireside) 'Rock fibre slab' insulation of a stated density 80Kg/m<sup>2</sup>

#### Test Results:

Integrity                      71 minutes

Insulation                      71 minutes

The test was discontinued after a period of 71 minutes.

Test date                      :    14<sup>th</sup> December 2009

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## Declaration by Magboard Benelux

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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:

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For and on behalf of:

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## Signatories

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Responsible Officer

A Kearns\* - Technical Manager



Approved

D Hankinson \* - Principal Certification Engineer

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

Report Issued:

25<sup>th</sup> February 2013

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

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