

**Title:**

The Fire Resistance  
Performance of USG  
Fiberock Clima Tough  
Interior Partition Assemblies

**WF Report No:**

149963

**Prepared for:**

**USG (UK) Ltd.**

1 Swan Road  
South West Industrial  
Estate  
Peterlee  
Co. Durham  
SR8 2HS

**Date:**

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## Executive Summary

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<b>Objective</b>	This report presents an appraisal of the fire resistance performance of steel stud, plasterboard clad partition assemblies incorporating 'USG Fiberock Clima Tough Interior' wallboard.
<b>Report Sponsor</b>	<b>USG (UK) Ltd.</b>
<b>Address</b>	1 Swan Road South West Industrial Estate Peterlee Co. Durham SR8 2HS
<b>Summary of Conclusions</b>	Should the recommendations given in this report be followed, it can be concluded that the proposed partitions, should be capable of providing the required 30 or 60 minutes integrity and insulation performance (dependent upon the number of board layers), if tested in accordance with Clause 5 of BS 476: Part 22: 1987.
<b>Valid until</b>	1 <sup>st</sup> November 2010

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## Introduction

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This report presents an appraisal of the fire resistance performance of 'USG Fiberock Clima Tough Interior' partition assemblies which are similar to that previously tested under the reference WF Test Report No. 145784.

The proposed partitions are required to provide 30 or 60 minutes integrity and insulation performance (dependent upon the number of layers of board incorporated), with respect to 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

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### Supporting construction

It is assumed that the construction which supports the proposed partitions, is adequately fire protected and capable of supporting them for the required 30 or 60 minutes.

### General Construction

It is assumed that the proposed partitions shall be identical to that tested under the reference WF Test Report No. 145784, unless otherwise specified in this report.

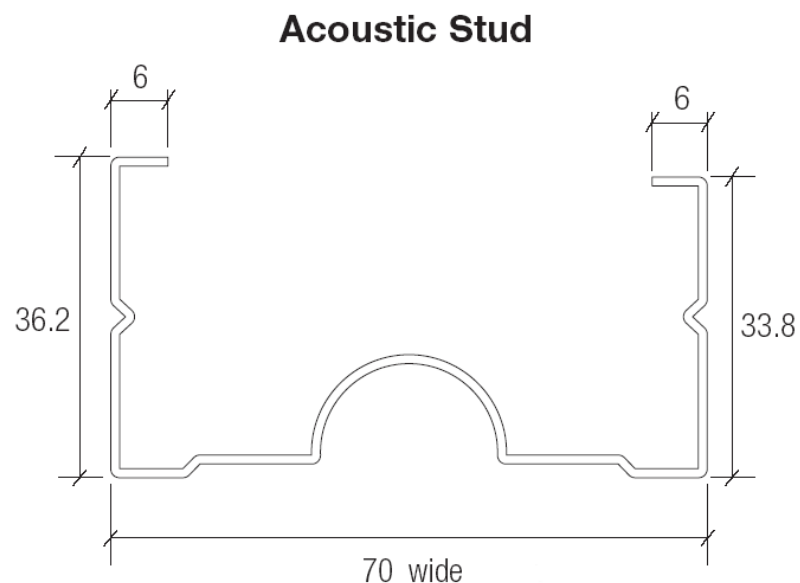
## Proposals

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It is proposed that the partition assembly detailed within the test report referenced WF Test Report No. 145784, which comprises a single a single layer of 15.8 mm thick 'USG Fiberock Clima Tough Interior' wallboard on each side of a 70 mm deep steel stud, may be modified as follows:

- a) The partition may comprise a single layer of 12.7 mm thick 'USG Fiberock Clima Tough Interior' wallboard on each face for only 30 minutes integrity and insulation performance.
- b) The partition may comprise two layers of 12.7 mm thick 'USG Fiberock Clima Tough Interior' wallboard on each face (with staggered joints) for 60 minutes integrity and insulation performance.
- c) The partition may incorporate any brand of glass or mineral fibre insulation within the internal cavity.

- d) The partition may incorporate Speedline Acoustic studs (as shown below) as opposed to the standard Speedline studs tested. These studs are of similar of overall dimensions but shall incorporate an additional semi-circular profile at the mid-span of the web to enhance the acoustic performance.



- e) The joints of the partitions being appraised may be taped and finished using either Speedline Durabond 45 or USG Sheetrock Durabond 45 joint compound (identical products under different branding).

## Basic Evidence

### WF Test Report No. 145784

A fire resistance test in accordance with BS 476: Part 22: 1987 on a specimen of a symmetrical, non-loadbearing wall assembly.

The test construction had overall nominal dimensions of 3035 mm high by 3000 mm wide by 100 mm thick and comprised 'Speedline' steel 'C' section studs at 600 mm centres screw fixed into 'Speedline' steel head and base channels. Each face of the framework was clad with a single layer of nominally 15 mm thick 'USG Fiberock' wallboard.

The test specimen provided 61 minutes integrity and 49 minutes insulation performance.

## Assessed Performance

### 30 Minutes Integrity and Insulation

The proposal requires a reduction in the thickness of each layer of board from the 15.8 mm tested to 12.7 mm. It is required that this reduced specification of partition shall provide at least 30 minutes integrity and insulation performance.

A thinner board to that tested will be prone to degradation and detachment at an earlier stage of a fire test and, in terms of insulation performance, the rate of thermal transfer through the boards and partition should also increase.

Although the proposal requires a significant proportional reduction in thickness of 20%, this is deemed to be offset by more substantial reductions in performance of 51% on integrity and 39% on insulation. Since the correlation between a reduction in thickness and the integrity and insulation performance is not necessarily linear, the aforementioned logic may be regarded as somewhat simplistic. The significant margin between the reduction in thickness and the reduction in performance does, however, provide increased confidence in the proposal.



It is therefore expected that the proposed partition comprising a single layer of 12.8 mm thick board on each face should be capable of providing at least 30 minutes integrity and insulation performance.



### 60 Minutes Integrity and Insulation

The partition may alternatively comprise two layers of 12.8 mm thick board on each face, with the joints staggered by a minimum of 100 mm between adjacent layers. The board layers shall be independently fixed to the steel studs. The method of fixing each layer of board shall be identical to that tested. Such assemblies are required to provide 60 minutes integrity and insulation performance.

In terms of integrity performance, the previously tested assembly comprising a single layer of board of 15.8 mm thickness on each face has demonstrated its ability to provide 61 minutes integrity performance. The proposal requires this to be increased to a total board thickness of 25.6 mm on each face (a 62% increase in thickness).



Based upon this significant increase in the total thickness, it is expected that this modified assembly should be more than capable of providing the required 60 minutes integrity performance.

The tested assembly only achieved 49 minutes insulation performance and the 11 minute shortfall on integrity performance is therefore required to be offset by the increase in board thickness.

During the previous fire test, the mean unexposed surface temperature rise criteria was not exceeded during the required period of 60 minutes and the maximum unexposed surface temperature requirement was exceeded by only one thermocouple during this period.

Photographs taken of the specimen subsequent to the test indicate that only one section of board had detached from the exposed face of the partition during the test, and the position at which the maximum unexposed temperature rise criteria was exceeded coincided with the position of this board loss.

The benefits of the proposed modification for 60 minutes fire performance are expected to be two-fold. Firstly an increase in the total board thickness by 62% should significantly reduce the ability of the partition to conduct heat to the unexposed face.

Secondly the use of two board layers instead of the tested single layer may also be slightly advantageous, regardless of the increase in thickness. The use of two layers of board enables the board joints to be staggered, thereby inhibiting the passage of hot gases to the unexposed face. The independent fixing of the two board layers should also ensure that they remain in position for a longer period. During the previous fire test the exposed facing will have been subjected to slow degradation until such a time that the fixings provided minimal retention at the board edges. In the proposed application, the exposed layer of board shall be subjected to similar conditions, but once this outer layer has detached, the inner layer (which was protected up until this stage) should still be provided with a sound fixing thereby prolonging the retention of the boards on the exposed face.

It is therefore anticipated that the proposed increase in board thickness by 62%, along with the use of two independently fixed layers of board on each face should more than adequately offset the 11 minutes shortfall on insulation performance.

## **Insulation**

It is proposed that any brand of mineral or glass fibre insulation may be incorporated within the cavity. It is, however, a requirement of this assessment that the insulation material shall be independently supported within the cavity rather than being retained solely by the outer boards. This may require the use of a self supporting rigid or semi-rigid insulation material friction fitted within the 'C' section studs or the use of a proprietary means of support, if the material is not capable of supporting its own weight.

The incorporation of insulation within the cavity of the partition may result in slightly more onerous conditions for the layer(s) of board positioned on the exposed face. The insulation would be expected to prevent the dissipation of heat on the unexposed face of the boards thereby retaining the heat within the boards and possibly accelerating their degradation and detachment.

This is, however, considered to be more than adequately offset by the additional protection that the insulation material shall afford to the layers positioned on the unexposed face of the partition, both whilst the exposed layers of board remain in position and subsequent to their detachment.

The incorporation of the insulation material is therefore expected to have either a neutral or slightly beneficial influence on the required 30 or 60 minute, as appropriate.

### **Speedline Acoustic Studs**

The proposed acoustic studs shall have similar overall dimensions compared to the tested stud and shall be fabricated from a 0.5 mm steel thickness as tested. The tested studs had a nominal sections size of 70 mm by 31 mm with 5 mm wide return to the flanges. This compares with a section size of 70 mm by 36 mm with 6 mm returned flanges for the proposed stud.

The main difference between the two stud types is the incorporation of a semi-circular profile at mid-thickness of the acoustic stud. The incorporation of such a detail is purely to enhance the acoustic performance of the partition.

It is not expected that the incorporation of this profile should detract from the fire performance of the partition and may even have an incidental advantage in enhancing the lateral stability of the partition.

The use of the proposed studs may therefore be positively appraised.

### **Joint Finish**

It is proposed that the joints of the partitions being considered within this report may be taped and finished using either Speedline Durabond 45 or USG Sheetrock Durabond 45 joint compound. The joints of the tested assembly were sealed using CP606 intumescent sealant.

Although the tested intumescent sealant is specifically designed to perform a gap sealing function under fire test conditions, for the application proposed, the more traditional method of 'taping and filling' of the joints is recognised to be more appropriate. Empirical test evidence has also demonstrated this to be suitable for fire resistance applications.

The proposed system of tape and jointing compound is specifically designed to reinforce the joints of such an assembly and should therefore provide for a more secure method of abutting the boards, which in turn should enhance the stability of the boards and partition.

The partitions considered within this report are, in any case considered to be less onerous compared with the tested assembly with respect to the ability of the joints to resist burn through. Firstly, the partition comprising a single layer of 12.8 mm board on each face shall incorporate a very similar joint detail to that tested, but shall require only 30 minutes fire performance.

The 60 minute partition shall incorporate two board layers on each face with the board joints staggered between adjacent layers, which is deemed to provide significantly more protection to the joint positions.

In view of these proposed modifications to the partition, the use of the alternative materials to seal the joint positions is not expected to be detrimental to the required 30 or 60 minutes fire performance.

Although this jointing system is not necessarily deemed to be inferior to that tested, since the tested partition only satisfied the integrity performance criteria for a period of 61 minutes, it is not considered prudent that the proposed change shall be made to the tested assembly, in the absence of any notable overrun. The significant increase in board thickness, use of staggered joints and/or substantial period of overrun achieved (with respect to 30 minutes partitions) are, however, deemed sufficient to justify such a modification to the partitions being appraised within this report.

## Conclusions

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It is expected that the modified partitions discussed within this report should provide the required 30 or 60 minutes integrity and insulation performance, if tested in accordance with Clause 5 of BS 476: Part 22: 1987.

## Validity

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This assessment is issued on the basis of test data and information available at the time of issue. If contradictory evidence becomes available to warringtonfire the assessment will be unconditionally withdrawn and USG (UK) Ltd 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> November 2010, 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.

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## Summary of Supporting Data

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**WF Test Report  
No. 145784**

A fire resistance test performed in accordance with Clause 5 of BS 476: Part 22: 1987 to determine the fire resistance performance of a symmetrical, non-loadbearing partition assembly.

The partition had overall nominal dimensions of 3035 mm high by 3000 mm wide by 100 mm thick and comprised 'Speedline' steel 'C' section studs at 600 mm centres screw fixed into 'Speedline' steel head and base channels. Each face of the framework was clad with a single layer of nominally 15 mm thick 'USG Fiberock' wallboard.

The test specimen provided 61 minutes integrity and 49 minutes insulaton performance.

Test sponsor : USG (UK) Ltd.

Test date : 2<sup>nd</sup> April 2005

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## Declaration by USG (UK) Ltd.

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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 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 D Hankinson* - Technical Consultant

Approved S. Hankey* - Technical Consultant

\* For and on behalf of warringtonfire

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