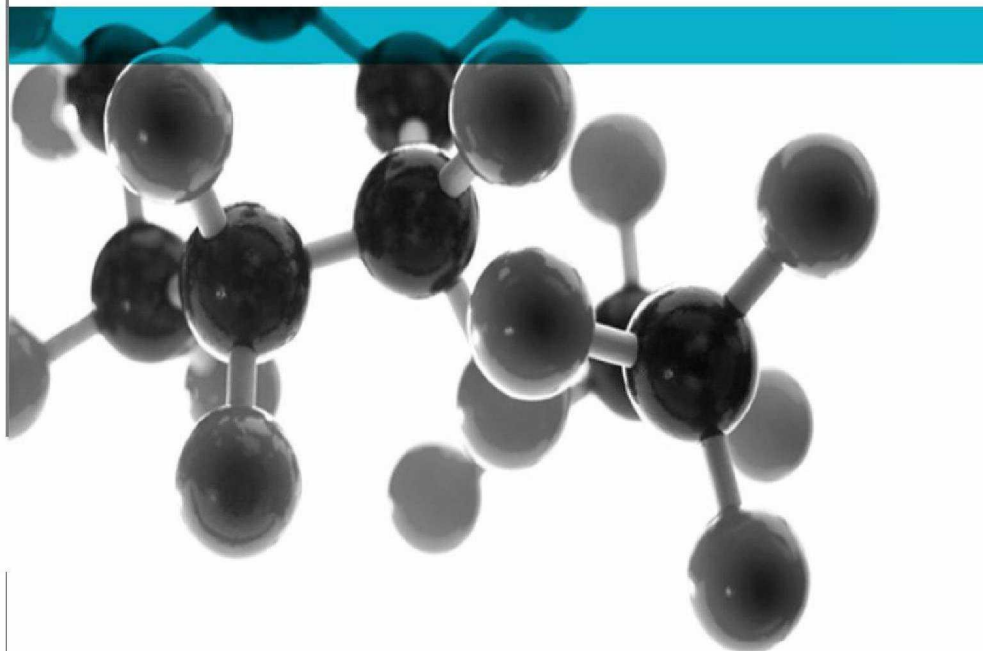


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Assessment of the fire performance of an external wall systems for use on high rise buildings in Ocean H Estate



A Report To: Higgins Construction PLC

Document Reference: 354489

Reference: Ocean H Estate

Date: 20th July 2015

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Page 1

Executive Summary

Objective To determine the compliance of a ventilated and insulated external wall system and utilising K15 phenolic insulation for use on multi-storey (5-12 storey) buildings with the requirements of the Building Regulations for England and Wales as defined in Approved Document B. The external wall is faced with brick.

Generic Description

The Brick faced system build up comprises:

- A double layer of 15mm thick Gyproc Wallboard Plasterboard, tape and joint finish, fastened to the Metsec frame (internal wall)
- Vapour control barrier
- 150mm SFS frame fully filled with Mineral Wool (Knauf Earth Wool) Insulation
- Cement particleboard (Versapanel)
- Phenolic Foam (Kingspan Kooltherm K15)
- Cavity with Mineral Wool (Lamathern) based cavity barriers installed at each floor level
- Brick ties to suit cavity thickness fixed into brick and SFS.
- Brick (external wall)

**Report
Sponsor**

Higgins Construction PLC, One Langston Road, Loughton, Essex, IG10 3SD

Document No.: 354489
Author: Janet Murrell
Client: Higgins Construction PLC

Page No.: 2 of 13
Issue Date: 20th July 2015
Issue No.: 1

Opinion

We consider that the information reviewed in this document is sufficient to allow a conclusion to be drawn that the fire performance of the system described will be sufficient to meet the requirements of the Building Regulations for England and Wales for Ventilated External Wall Systems on high rise buildings

Document No.:	354489	Page No.:	3 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

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CONTENTS	PAGE NO.
Executive Summary.....	2
Signatures.....	4
Introduction.....	6
Supporting Documentation.....	6
Description of the Proposed System.....	8
Assessment.....	9
Conclusion.....	11
Revision History.....	12

Document No.:	354489	Page No.:	5 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

Introduction

Terms Of Reference

Exova Warringtonfire have been instructed by Higgins Construction PLC to assess the compliance of an external ventilated cavity system to be used in multistorey buildings (5 to 12 storeys high) to the requirements of the current Building Regulations for England and Wales following the guidance given in Approved Document B.

Introduction

The façade construction includes the use of an organic cellular foam, Kingspan Kooltherm K15 (referred to hereafter as K15), as the insulation in the external build-up of the ventilated system.

In buildings taller than 18 m, insulation materials in ventilated external wall systems should be of limited combustibility to meet the contemporary design guidance to the Building Regulations. The general intent is that buildings with a storey at a height of more than 18 m above the external access level cannot be easily reached by fire and rescue service equipment and personnel. Therefore the materials in the build up of external walls in buildings over 18m should be provided with means of reducing fire spread risk.

For buildings in the Ocean H Estate, this restriction is applicable. K15 insulation has been proposed to meet the thermal insulation performance within this construction. This insulation product is based on a thermoset material (phenolic foam), which is organic in nature and therefore classed as combustible. It therefore does not meet with the above fire strategy requirement.

There is a need to assess this material for suitability in these external wall systems and to look at the overall potential performance of the total system based on various fire test reports. For a combustible material to be used at heights of over 18m the guidance given in the Building Regulations for England and Wales is that it should have a fire performance of at least B-s3,d2 when classified to BS EN 13501-1 and in addition should be tested against BS 8414-2 and assessed against the requirements of BR 135.

Document No.:	354489	Page No.:	6 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

Supporting Documentation

The following reports and drawings have been used in this assessment of the ventilated external wall system which is proposed for use on high rise buildings in the Ocean H Estate development.

Product (Component Part of External Wall System)	Reports and other Information	
	Brick Face	
British Gypsum Wallboard 15mm	Classified without further testing as A2-s1, d0 Commission Decision 96/603/EC, as amended 2000/605/EC And in addition 2 layers of 12.5mm wallboard gives 30 minutes integrity	
Vapour Barrier	Combustible	
Knauf Earth Wool Mineral wool	Class A1 to BS 13501-1	
Versapanel Cement Particleboard	Class 0 and Class B-s1,d0 WF 124784 and 124785	
Kingspan K15 Phenolic Foam Insulation	BBA Certificate 08/4582 BRE Report 220876 to BS 8414-1 BRE Report 293940 to BS8414-2 BRE Report 297099 to BS8414-2 AFITI Report 8482/11 to EN 1363-1 BRE Report 218611 to BS EN 1364-1 EWF Report 323655 to BS EN 1365-1 BRE Report CC 301393	
Lamatherm EW-CB Cavity Barrier	Tested to BS 476 Part 20: giving 60mins integrity WFRC 136497, Certifire Approval CF 563	
Brick	Deemed to Satisfy A1 Commission Decision 96/603/EC, as amended 2000/605/EC	

1. BRE Test Report No 293940

A fire test in accordance with BS8414 -2 (where the façade system is mounted onto a steel structure rather than a masonry wall) was carried out on a Kingspan K15 insulated system with a ventilated Trespa Rainscreen facing.

The system consisted of a double layer of wall board mounted onto a 150mm steel frame. The steel frame system (SFS) was installed between the floor slab hangers on the main wall with horizontal base and head trackers fixed to the steel substrate. On the face of the steel frame was mounted 15mm thick cement sheathing board.. On this were mounted aluminium L and T rails. A single layer of 85mm K15 Kooltherm insulation board was fixed to the sheathing board with screws and plastic washers, the aluminium helping hand brackets protruding through precut slots in the K15 board. The construction was faced with 15mm thick Trespa, a high pressure laminate, decorative rainscreen board. The reaction to fire performance of these boards is B-s1,d0. In the ventilated cavity, three horizontal fire breaks (Lamatherm CW-RHS ventilated cavity barrier) were fixed to the sheathing board and three vertical non-ventilated barriers were installed on the outer edges of the cladding and around the fire source hearth.

Document No.:	354489	Page No.:	7 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

2. BRE Test Report No 297099

A fire test in accordance with BS8414-2 (where the façade system is mounted onto a steel structure rather than a masonry wall) was carried out on a Kingspan K15 insulated system with a ventilated Terracotta tile facing. The fire test configuration was similar to that above except that the insulation was 80mm thick and the facing used was Taylor Maxwell (Argeton) Classico 30mm x 250mm x 600mm tiles which were held in place using tile clips and Fixfast rivets which were fixed to the Taylor Maxwell Leg Tee support.

3. BRE Test Report No 220878

A fire test in accordance with BS8414 - 1 (where the façade system is mounted onto a masonry wall) was carried out on a Kingspan K15 insulated system with a ventilated cement particle board facing. Panels were 1200mm x 900mm x 6mm thick.

The system consisted of a single layer of 60mm K15 Kooltherm insulation board was fixed to the masonry wall(a blockwork structure) with screws and plastic washers. An aluminium railing system was also mechanically fixed to the blockwork wall to which was fixed the 6mm thick cement particle boards at 600mm centres. The fire stopping was provided in the ventilated cavity and consisted of a graphite based intumescent strip bonded to nominal 0.6mm thick galvanised steel positioned horizontally above the fire chamber at a distance of 0.5m and 4m.

4. WF Test Report No 323655

A indicative fire test in accordance with EN 1363-1 on a Kooltherm K15 insulation without facing, to demonstrate integrity only.

5. AFIT Test Report No 8482/11

A fire test in accordance with EN 1365-1 on a load bearing wall assembly consisting of a stud partition wall with Kooltherm K15 insulation faced on the fire side with 9mm cement particleboard and on the non fire side with 2 layers of 12.5mm plasterboard.

6. WF Test Report No 189654

A fire resistance test utilising the general principles of BS 476: Part 20: 1987 on six floor mounted and four wall mounted cavity barrier specimens, some including a plastic sheathing to the stone wool which provides for the fire stopping of the cavity.

Document No.:	354489	Page No.:	8 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

Description of the Proposed System

The proposed system comprises:

Generic Description
<p>The Brick faced system build up comprises:</p> <ul style="list-style-type: none">• A double layer of 15mm thick Gyproc Wallboard Plasterboard, tape and joint finish, fastened to the Metsec frame (internal wall)• Vapour control barrier• 150mm SFS frame fully filled with Mineral Wool (Knauf Earth Wool) Insulation• Cement particleboard (Versapanel)• Phenolic Foam (Kingspan Kooltherm K15)• Cavity with Mineral Wool (Lamatherm) based cavity barriers installed at each floor level• Brick ties to suit cavity thickness fixed into brick and SFS.• Brick (external wall)

Assessment

During the tests on the external wall systems in BRE reports nos 293940, 297099 and 220878 the maximum external air temperature at level 2 remained below the limit of 600°C within 15 minutes of the start time as did the temperature within the cavity between the external finish and the K15 insulation and the temperature at the mid depth of the insulation. The approximate maximum temperatures in each test at each location within the first 15 minutes of the test are tabulated below

	BRE Report No 293940 (SFS system)	BRE Report No 297099 (SFS system)	BRE Report No 220878 (masonry system)
Air Temperature	530°C	420°C	500°C
Mid Point Cavity Temperature	140°C	100°C	380°C
Mid Point of Insulation	30°C	60°C	190°C

These tests determine the fire performance of the insulation within the cavity and illustrate which temperatures were recorded at the storey immediately above the fire source. The temperatures within the cavity are dependant on the nature of the fixing detail on the sill above the fire which should be that installed in practice as a window and also on the nature of the facing used.

There are a number of differences between the tested systems and the proposed system to be used by Higgins Construction PLC, the most important of which is the use of brick as the facing to the external wall of the system. Other differences can be summarized as follows:

- The internal lining in the tests with SFS framework comprised a double layer of 12.5 mm Gyroc wallboard to which the SFS frame was directly fixed. This is replaced by a double layer 15mm Gyroc wallboard which should provide a greater degree of fire protection to the building itself reducing burn through. A double layer of gypsum board of 12.5mm provides 30 minutes fire integrity and it would be expected that the double layer of 15mm would provide at least this time for escape and fire fighting.
- With the proposed system, one layer of 12mm flexible cement particleboard is used on the non cavity side of the K15 foam. It should perform at least as well as the 15mm tested cement board in the BS 8414 tests.
- With the tested systems there is no insulation in the SFS frame. With the proposed system the frame incorporates insulation Knauf Earth Wool insulation which should significantly slow heat transfer to the gypsum board and make burn through less likely. The frame is also used as an infill between reinforced concrete which itself would provide an effective fire barrier and a significant heat sink to any fire.
- The K15 insulation was tested at thicknesses of 60, 80 and 85mm and will be used in the proposed systems at a thickness of 110mm. For the 110mm insulation, the increased thickness

Document No.: 354489

Author: Janet Murrell

Client: Higgins Construction PLC

Page No.: 10 of 13

Issue Date: 20th July 2015

Issue No.: 1

will serve to protect the building itself by insulating it against heat transfer into the building slightly more than the thinner thicknesses and therefore the change should improve performance. K15 insulation is a thermosetting foam which tends to char under the influence of heat before being eventually combusted due to prolonged direct flame exposure. This however takes a period of time as can be demonstrated by the fire resistance test conducted on the Kingspan K15 insulation by AFITl where 100mm thick unfaced foam was exposed to the time temperature curve in EN1363- 1. After 30 minutes exposure to temperatures up to 830°C, the foam, although very charred, was still in tact. Direct flame impingement onto the insulation should failure occur of the aluminium based facing mounted on standard plywood should still provide 30 minutes protection into the building. The SFS frame is also filled with 150mm mineral fibre which will also serve as protection to the internal lining, the two 15mm gypsum boards.

- The systems in the tests conducted were clad on the exterior with either a Trespa (high pressure laminate) rainscreen system or a terracotta tile rainscreen system or cement particle board system. The proposed system has a brick facing which will remain in place during any fire. We would therefore expect the external temperatures to be no higher than they were in the tests conducted and less than those in the Trespa test due to the combustible nature of the facings. We would also expect that the performance of the cladding in protecting the cavity and the insulation behind would be as effective as with the terracotta tiles and the cement particle board and would therefore expect the cavity and the insulation temperatures to be similar to those in the tested systems
- The cavity barriers in the tests conducted to BS8414-2 were mineral fibre batts. Lamatherm mineral fibre cavity barriers with a 60 minute performance are intended to be fitted in the proposed system to prevent any potential fire spread in either a vertical or a lateral direction.

Note: Cavity barriers should be fitted in accordance with section 9 of Approved Document B, volume 2.

Document No.:	354489	Page No.:	11 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

Conclusion

Opinion It is therefore our opinion that the Brick faced Kingspan K15 insulated ventilated external wall system as proposed and as described would satisfy the performance criteria detailed in BR 135 third edition, if tested against BS8414-2:2005.

Validity of opinion This opinion is based on the requirements of BR 135, third edition and against the requirements of the Building Regulations for England and Wales based on the guidance given in Approved Document B to those regulations.

The opinion has been formulated on the assumption that the information provided by the client was correct and issued by independent third parties and that the client was not aware of any information that could have been provided which may adversely affect the conclusions drawn in the assessment.

This assessment is issued on the basis of test data and information available at the time of issue and provided by Higgins Construction PLC. The assessment is invalidated if the proposed construction is subsequently tested since test data takes precedence over an expressed opinion. Any changes in the proposed system described in this assessment will invalidate this assessment. This assessment relates only to the buildings at the Ocean H Estate.

This assessment has been carried out in accordance with the Fire Test Study Group Resolution No 82. It relates to the fire performance of the product and does not cover aspects of quality, durability, maintenance or service requirements. This assessment relates only to the specimen(s) assessed and does not by itself infer that the product is approved under any certification scheme.

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Document No.:	354489	Page No.:	12 of 13
Author:	Janet Murrell	Issue Date:	20 th July 2015
Client:	Higgins Construction PLC	Issue No.:	1

Revision History

Issue No :	Issue Date:
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