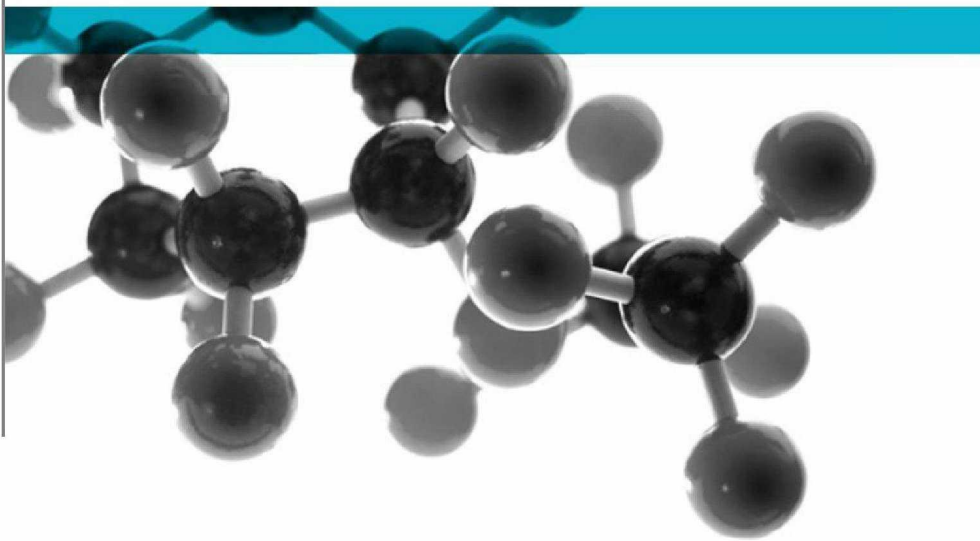


Assessment of the fire performance of an external wall system for use on high rise buildings in The International Centre, Stratford London.



Executive Summary

Objective

To determine the compliance of a GRC rainscreen cladding system attached on SFS and utilising K15 phenolic insulation for use on multi-storey (17 and 30 storey buildings) with the requirements of the Building Regulations for England and Wales as defined in Approved Document B.

Generic Description

The system build up comprises:

- Structure formed by casting in precast balconies with integrated thermal breaks (Halfen)
- SFS stud system internally
- Y board (cement board type product) fixed to SFS
- Helping hands fixed to SFS through the Y board
- K15 installation also fixed to the Y board with patching actioned around the helping hands
- Corophyl vois former
- Bearers attached to the helping hands to hold the cladding panels
- GRC cladding installed onto previously installed bearers.

Report Sponsor

LEND LEASE CONSTRUCTION EUROPE LTD, Regent's Place, 20 Triton Street
London NW1 3BF

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 Facades on high rise buildings

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Issue Date:

Client: Lend Lease Construction Europe Ltd

Issue No.: 1

Signatories

Responsible Officer Janet Murrell * Technical Manager

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

Report Issued:

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Introduction

Terms Of Reference

Exova Warringtonfire have been instructed by Lend Lease Construction Europe Ltd to assess the compliance of an external façade system to be used in two multistorey buildings (17 and 30 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 foam Kingspan Kooltherm K15 (referred to hereafter as K15) as the insulation in the external façade build-up of the rainscreen ventilated system.

In buildings taller than 18 m, insulation materials in external facades 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 content of facades in buildings over 18m should be provided with means of reducing fire spread risk via the façade.

For both buildings in the International Quarter in Stratford London this restriction is applicable. K15 insulation has been proposed to meet the thermal insulation performance within this façade 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 this façade 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.

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Supporting Documentation

The following reports and drawings have been used in this assessment of the ventilated rainscreen façade system which is proposed for use on high rise buildings in The International Quarter Stratford.

Product (Component Part of Façade)	Reports and other Information
RCM Y Wall (Calcium Silicate Based Sheet)	WF Report No 159366 to BS 476 Part 4 BBA Certificate 14/5109 WF Report No 321837 to BS EN 1182 WF Report No 321838 to BS EN 1716
Corofil Full Fill Cavity Barrier (C450 Cavity Firestop)	Report needed
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
Glass Reinforced Cement Tiles	Report Needed

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 Trespa decorative rainscreen board. 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.

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 x600mm tiles which were held in place using tile clips and Fixfast rivets which were fixed to the Taylor Maxwell Leg Tee support.

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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 Klingspan K15 insulated system with a ventilated cement particle board facing.

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 galavnised steel positioned horizontally above the fire chamber at a distance of 0.5m and 4m.

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Description of the Proposed System

The proposed system comprises:

- A structure formed by casting in precast balconies with integrated thermal breaks (Halfen)
- A 150mm deep SFS frame (insulated)
- One layer of 9mm Y wall board, a flexible calcium silicate based fibre cement building board fixed to the SFS system
- Helping hands fixed to SFS through the Y wall board
- K15 Kingspan Insulation 100mm thick fixed to the Y wall board.
- A 60mm ventilated cavity
- PFC Corofil C450 75mm thick mineral fibre cavity fire stops fitted vertically between the balconies
- Bearers attached to the helping hands to hold the cladding panels
- Glass Reinforced Concrete cladding installed onto previously installed bearers.
- Precast balconies separate the cladding at every level at approximately 3m centres.

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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

There are a number of differences between the tested systems and the proposed system be used by Lend Lease Construction Europe Ltd. These 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 wallboard which should provide a greater degree of fire protection to the building itself reducing burn through.
- With the proposed system, only one layer of 9mm flexible calcium silicate based fibre cement building board is fixed to the SFS system. The Y wall board to be used is non combustible and has a 60 minute integrity performance when tested for its fire resistance. It should perform at least as well as the tested cement board.
- With the tested systems there is no insulation in the SFS frame. With the proposed system the frame incorporates insulation which should make burn through less likely.
- The K15 insulation was tested at thicknesses of 60,80 and 85mm and will be used in the proposed system at a thickness of 100mm. The increased thickness will serve to protect the building itself by insulating it against heat transfer slightly more than the thinner thicknesses and therefore the change should improve performance.
- The exterior of the systems in the tests conducted were clad in either a Trespa rainscreen system or a terracotta tile rainscreen system or cement particle board system. The proposed system has a glass reinforced cement board rainscreen cladding. This is a non combustible board which is bound with the glass fibres to give additional structural strength. We would therefore expect the external temperatures to be no higher than they were in the tests conducted. 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 would therefore expect the cavity and the insulation temperatures to be similar to those in the tested systems.

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- The cavity barriers in the tests conducted to BS8414-2 were mineral fibre batts as intended to be fitted in the proposed system however these were fitted both vertically and horizontally in the tested system. In the proposed system there are concrete balconies and ledges at each storey in the high rise building. The concrete acts as a solid fire break in the ventilated façade system therefore for each floor, any potential fire spread can only occur in the lateral direction. Cavity barriers are therefore only proposed to be fitted vertically. These should be fitted in accordance with section 9 of Approved Document B, volume 2.

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Conclusion

Opinion It is therefore our opinion that the Glass reinforced concrete faced Kingspan K15 insulated rainscreen ventilated façade 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. 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 International Quarter, Stratford.

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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Revision History

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Reason for Revision:	

Issue No :	Issue Date:
Revised By:	Approved By:
Reason for Revision:	