Title:

The Fire Performance of Celotex - PIR Façade Cladding Systems when tested following BS 8414 Part 2:2005

Report No:

WF No. 351551

Prepared for:

Celotex Insulation Ltd

Lady Lane Industrial Estate
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Executive Summary

Objective	This report presents an appraisal of the fire performance of Celotex - PIR Façade Cladding Systems when tested following BS 8414 Part 2:2005
Report Sponsor	**Celotex Insulation Ltd**
Address	Lady Lane Industrial Estate, Hadleigh, Suffolk, IP7 6BA
Summary of Conclusions	It can be concluded that Celotex - PIR Façade Cladding Systems, as described in the proposals section of this report, are expected to meet the performance criteria set out in BR 135:2003 for façade systems based on the expected behaviour in the BS 8414 Part 2:2005.
Valid until	1st February 2019

Introduction

This report presents an appraisal of the Celotex - PIR Façade Cladding Systems. The systems are based on the Celotex RS5000 insulation boards, attached to the facings of steel frame structure, and an external cladding.

A version of the system has been tested and is described in BRE Report 295389. The system is generally composed of 100 mm Celotex RS5000 boards attached to a magnesium oxide boards substrate, and covered with a 12 mm Marley Eternit Naura rainscreen boards. The report further decscribes the fixing details, as well as the application of horizontal and vertical fire breaks.

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

Construction details

It is assumed that the construction will be executed within the design constraints as outlined in the test reports, assessments and certificates which are used to assess this construction.

Cavity Barriers

It is assumed that Cavity Barriers will be applied as required by the appropriate Building Regulations, as defined in Section 9 of Approved Document B.

Proposals

General construction

The following Facade System designs will be evaluated in this report, and are schematically represented below:

- Design 1: Inside to out
  2x 12.5mm Plasterboard
  100mm SFS
  12mm Calcium Silicate Board – A1
  100mm Celotex RS5000
  Unventilated Cavity
  103mm Brickwork Façade
  Stainless Steel Ties

- Design 2: Inside to out
  2x12.5mm Plasterboard
  100mm SFS
  12mm Calcium Silicate Board – A1
  100mm Celotex RS5000
  Ventilated Cavity
  8mm x Terracotta Cladding
  Brackets and rails

- Design 3: Inside to out
  2x12.5mm Plasterboard
  100mm SFS
  12mm Calcium Silicate Board – A1
  100mm Celotex RS5000

Ventilated Cavity
Cladding Laminates – A1
Brackets and rails

- Design 4: Inside to out
  2x12.5mm Plasterboard
  100mm SFS
  12mm Calcium Silicate Board – A1
  100mm Celotex RS5000
  Ventilated Cavity
  Cladding - Aluminium – Class O
  Brackets and rails

Fire breaks

Fire breaks are to be installed as required in the relevant sections of the Building regulations, and as described in the test report.

Basic Test Evidence

BRE Test report 295369

The BRE Test report 295369 describes the fire performance of the Celtex façade cladding system when tested to BS 8414: Part 2:2005.

The test specimen was constructed as follows:

Metal frame, cladded with 12 mm Magnesium Oxide board

100 mm Celotex RS5000 PIR insulation

140 mm "helping hand" brackets

60x40x2 mm continuous aluminium rail

12 mm Marley Eternit Natura cladding panel

Leaving a 40 mm ventilated cavity between insulation and cladding

Lamatherm CW-RHS Horizontal intumescing Fire Breaks (Cavity Barriers) were fixed onto the Magnesium Oxide Boards in four positions, ate distances of 2.50 m; Lamatherm CW-RSV Vertical Fire Breaks (Cavity Barriers) were applied around the combustion chamber and at the outer edges of the test specimen. The application of fire breaks is as required to meet the appropriate Building Regulation requirements.

After ignition of the crib the tested lasted for 60 minutes, when all flaming had ceased. The insulation layer kept burning after the crib had extinguished. Damage to the insulation layer extended to about ¾ of the specimen, the insulation was severely charred, and damage extended beyond the position of the first horizontal fire breaks. Temperatures measured were within the limits specified in the BR 135, so it can be concluded concluded that the tested construction meets the performance criteria set in BR 135.

The test was carried out on the 2nd may 2014

Assessed Performance

Substrate

The substrate in the test referenced 295369 consisted of 12 mm magnesium oxide boards, fixed onto a steel frame. In the alternative designs the substrate is proposed to be 12 mm calcium silicate boards. In terms of fire properties and general physical properties the calcium silicate boards are very similar.It is therefore expected that the general behaviour of the construction, when tested in accordance with BS8414-2, will be significantly influenced by this change in substrate.

The nominal density of calcium silicate boards is 870 kg/m^3, lower than the nominal density of 1050 kg/m^3 for magnesium oxide boards. This could possibly result in lower thermal capacity, causing higher temperatures in the boards and the cavity behind it, but considering the actual temperatures measure during the test it is not expected that this change will result in exceeding of the the performance criteria set in BR 135.

It can therefore be concluded that the change of 12 mm magnesium oxide boards for 12 mm calcium silicate boards will not result in a significant change in test results when the constructions are tested in accordance with the BS 8414-2

Alternative design 1

Alternative design 1 is constructed, inside to out, as follows:

2x 12.5mm Plasterboard
100mm SFS
12mm Calcium Silicate Board – A1
100mm Celotex RS5000
Unventilated Cavity
103mm Brickwork Façade
Stainless Steel Ties

Fire breaks (cavity barriers) will be applied as described in test report BRE 295369; because the cavity is unventilated, and the brickwork façade sits flush against the insulation, the horizontal fire breaks will be of the "Lamatherm CW_RHS Non ventilated cavity barrier" type.

Substrate

As explained above, the change of 12 mm magnesium oxide boards for 12 mm calcium silicate boards will not have a significant effect on test results when the construction is tested in accordance with the BS 8414-2

External flame spread

The 12 mm Eternit Natura fibre cement board from the test is replaced by a brickwork façade, which is constructed from non-combustible (as defined in Section 8 of Appendix A of Approved Document B (2006) materials, giving a thicker construction of higher density. The flame spread over such a brickwork surface is expected to be at least as good as that over the tested fibre cement board surface, so it can be concluded that if the alternative construction 1 would be tested in accordance with BS 8414-2 the external flame spread results would still be meeting the requirements defined in BR 135.

Internal fire spread

Compared to the tested construction, the internal insulation material is better protected from the external fire by the brickwork. In the alternative design the effect of the external fire spread on the internal insulation will consequently be

less.

Compared to the tested construction, the internal insulation material sits closer to a brickwork construction, which will act as a heat sink. The access of oxygen to the material is restriced compared to the ventilated cavity in the tested construction, so it is expected that the internal burning of the insulation material will be less severe than in tested construction, and that the internal flame spread and temperatures will not exceed those in the tested construction.

Performance

Based on the considerations outlined above, it is expected that Alternative design 1, with an external brickwork façade and an unventilated cavity, when tested in accordance with BS 8414-2, will meet the performance requirements as outlined in BR 135

Alternative design 2

Alternative design 2 is constructed, inside to out, as follows:

2x 12.5mm Plasterboard
100mm SFS
12mm Calcium Silicate Board – A1
100mm Celotex RS5000
Ventilated Cavity
8 mm Terracotta Cladding
Brackets and rails

Fire breaks (cavity barriers) will be applied as described in test report BRE 295369.

Substrate

As explained above, the change of 12 mm magnesium oxide boards for 12 mm calcium silicate boards will not have a significant effect on test results when the construction is tested in accordance with the BS 8414-2

External flame spread

The 12 mm Eternit Natura fibre cement board from the test is replaced by 8 mm terracotta cladding, which is constructed from non-combustible (as defined in Section 8 of Appendix A of Approved Document B (2006) materials. The flame spread over this terracotta surface is expected to be as good as that over the tested fibre cement board surface, so it can be concluded that if the alternative construction 1 would be tested in accordance with BS 8414-2 the external flame spread results would still be meeting the requirements defined in BR 135.

Internal fire spread

If attached in a suitable method, comparable to the attachment of the fibre cement boards in the tested construction, the terracotta cladding is not expected to break or fall away during the exposure to the fire. It is therefore expected to provide a similar protection to the insulation material as the fibre cement board in the tested construction during the observed 30 minute fire exposure of the burning wood crib.

When tested in accordance with BS 8414-2, the internal insulation is exposed to very similar fire conditions as in the tested construction with fibre cement boards. Consequently, a very similar behaviour of the internal insulation material and the applied fire breaks is expected, and the internal temperature development is expected to be very similar. Considering the observed temperatures (maximum 140 °C in the cavity, and 40 °C in the insulation, and no significant temperature increase on the facing boards at level 2) it is not expected that the temperatures in the alternative construction will exceed the

requirements.

Performance

Based on the considerations outlined above, it is expected that Alternative design 2, with an external terracotta cladding over a ventilated cavity, when tested in accordance with BS 8414-2, will meet the performance requirements as outlined in BR 135

Alternative design 3

Alternative design 3 is constructed, inside to out, as follows:

2x 12.5mm Plasterboard
100mm SFS
12mm Calcium Silicate Board – A1
100mm Celotex RS5000
Ventilated Cavity
A1 Cladding laminates
Brackets and rails

Fire breaks (cavity barriers) will be applied as described in test report BRE 295369.

Substrate

As explained above, the change of 12 mm magnesium oxide boards for 12 mm calcium silicate boards will not have a significant effect on test results when the construction is tested in accordance with the BS 8414-2

External flame spread

The 12 mm Eternit Natura fibre cement board from the test is replaced by A1 cladding laminates, which show a non-combustible (as defined in Section 8 of Appendix A of Approved Document B (2006) reaction to fire behaviour. The flame spread over this non-combustible surface is expected to be as good as that over the tested fibre cement board surface, so it can be concluded that if the alternative construction 1 would be tested in accordance with BS 8414-2 the external flame spread results would still be meeting the requirements defined in BR 135.

Internal fire spread

The behaviour of A1 cladding material can not be predicted based on the A1 reaction to fire classification alone. It may be possible that the material will break or fall away during the exposure to the crib fire in the BS 8414-2 test. If there is evidence available that the chosen cladding will provide a similar protection to the insulation material as the fibre cement board in the tested construction during the observed 30 minute fire exposure of the burning wood crib, it can be assumed that the behaviour of the internal insulation and the applied fire breaks will be similar to the behaviour in the tested construction.

The alternative cladding material should demonstrate a behaviour without cracking, melting, or falling away during a 30 minute fire exposure, and have physical properties (thermal conductivity, density, heat capacity, thermal inertia) similar to the tested fibre cement board cladding

A product like Promatect 50, as described in Certifire certificate CF 843 to demonstrate a 60 minute fire resistance performance when applied as single boards in 12 mm thickness in a metal stud partition, is an example.

Performance

Based on the considerations outlined above, it is expected that Alternative design 3, with external A1 Cladding (meeting the requirements outlined above) over a ventilated cavity, when tested in accordance with BS 8414-2, will meet the performance requirements as outlined in BR 135

Alternative design 4

Alternative design 2 is constructed, inside to out, as follows:

2x 12.5mm Plasterboard
100mm SFS
12mm Calcium Silicate Board – A1
100mm Celotex RS5000
Ventilated Cavity
Aluminium sheeting
Brackets and rails

Fire breaks (cavity barriers will be applied as described in test report BRE 295369.

Substrate

As explained above, the change of 12 mm magnesium oxide boards for 12 mm calcium silicate boards will not have a significant effect on test results when the construction is tested in accordance with the BS 8414-2

External flame spread

The 12 mm Eternit Natura fibre cement board from the test is replaced by an aluminium sheet cladding, Aluminium sheeting is considered non-combustible (as defined in Section 8 of Appendix A of Approved Document B (2006). The flame spread over this metal surface is expected to be as good as that over the tested fibre cement board surface, so it can be concluded that if the alternative construction 1 would be tested in accordance with BS 8414-2 the external flame spread results would still be meeting the requirements defined in BR 135.

Internal fire spread

The aluminium sheet cladding is expected to provide a protection from flame exposure to the insulation material; however, it does not provide any thermal insulation, and does not shield the internal insulation from the heat of the flames.

Compared to the tested construction with fibre cement boards, the insulation material and fire breaks are exposed to a more intense fire situation. The effect of this increased exposure is difficult to quantify, but it could result in a more intense burning of the insulation material, and possibly an earlier failure of fire breaks, and possibly a failure of the fire breaks to restrict the fire to the area observed in the test described in BRE 295369. Consequently, it can't be assumed that new construction will still meet the requirements as outlined in BR 135.

Performance

Based on the considerations outlined above, when Alternative design 4, with an external aluminium sheet cladding over a ventilated cavity, is tested in accordance with BS 8414-2, it can't be judged with certainty to meet the performance requirements as outlined in BR 135

Conclusions

It can be concluded that Alternative design 1, (based on Celotex RS5000 insulated façade system as described in BRE Test Report 286389) with an external brickwork façade and an unventilated cavity, is expected meet the performance criteria set out in BR 135:2003 for façade systems based on the expected behaviour in the BS 8414 Part 2:2005.

It can be concluded that Alternative design 2, (based on Celotex RS5000 insulated façade system as described in BRE Test Report 286389) with an terracotta rainscreen cladding and a ventilated cavity, is expected meet the performance criteria set out in BR 135:2003 for façade systems based on the expected behaviour in the BS 8414 Part 2:2005.

It can be concluded that Alternative design 3, (based on Celotex RS5000 insulated façade system as described in BRE Test Report 286389) with external A1 Cladding (meeting the requirements as outlined in the body of this report) over a ventilated cavity, is expected meet the performance criteria set out in BR 135:2003 for façade systems based on the expected behaviour in the BS 8414 Part 2:2005.

It can therefore be assumed that the constructions based on Celotex RS5000 insulation boards, as described in the body of this report, meet the requirements for external walls as outlined in section 12.5 of Approved Document B, *External Wall Construction*.

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 Celotex Insulation 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 1st june 2020, 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 Celotex Insulation Ltd

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:

For and on behalf of:

Signatories

Responsible Officer F. Paap* - Certification Engineer

Approved J Murrell* - Technical Manager

* For and on behalf of Exova Warringtonfire.

Report Issued: 7th May 2015

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