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ISO 9705 Fire Test on XFlam Polystyrene Insulated Panel

Author: **P. N. Whiting**
Fire Engineer

Reviewer: **P. C. R. Collier**
Research Engineer

Contact: **BRANZ Limited**
Moonshine Road
Judgeford
Private Bag 50908
Porirua City
New Zealand
Tel: +64 4 237 1170
Fax: +64 4 237 1171
www.branz.co.nz

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ISO 9705 Fire Test on XFlam Polystyrene Insulated Panel

1. CLIENT

Austral Comnia Holdings
78 – 80 Kingsway
Glen Waverley
Victoria 3150
Australia

2. INTRODUCTION

This report gives BRANZ's assessment of the reaction to fire of Bondor XFlam panel of nominal thickness 100 mm, when tested in accordance with ISO 9705:1993 'Fire tests – Full-scale room test for surface products' (the test standard). Included in this assessment is consideration of alternative fire rated sealants to used in all joints and junctions. The assessed performance is analysed in accordance with the BCA 2005 requirements for wall and ceiling linings.

3. BACKGROUND

Bondor XFlam panel of nominal 100 mm thickness has been tested in accordance with ISO 9705:1993 (the standard), and the results reported in BRANZ Fire Test Report FI3443 dated 20 July 2005. Towards the end of the test period, the gas flow to the burner decreased resulting in the heat output from the burner falling below the lower limit specified in the test standard for a period of 144 seconds from 1056 seconds to the end of the test at 1200 seconds.

In the construction of the specimen test, Fosroc Flamex PU fire rated sealant was applied to all joints, junctions, flashings and to seal around the thread of ceiling bolts.

4. DISCUSSION

The Building Code of Australia (BCA 2005) Specification C1.10a classifies wall and ceiling linings on the basis of the time taken for the combined heat output in an ISO 9705 test to exceed 1000 kW (or 1MW).

In accordance with the test standard, the gas flow rate is to be controlled to provide a heat output from the burner within ± 5% of the prescribed outputs of 100 kW for 600 seconds, followed by an output of 300 kW for a further 600 seconds. In the above test, the heat output of the burner fell below the ± 5% level in the 300 kW step after 1056 seconds and remained below till the end of the test. The maximum deviation did not exceed 7% (279 kW, i.e. 6 kW below the minimum of 285 kW required by the standard).

Observations made during and after the test record minor deformation of the metal skin and angles and no failures of the rivets. The total rate of heat release during the test including the contribution from the burner clearly indicates that the XFlam core material had only marginally become involved by the conclusion of the test, reaching a one minute averaged figure of 350 kW and a peak value of 401 kW at 957 seconds. These average and peak values include the burner contribution and are substantially below the 1 MW criteria used for BCA 2005 classification purposes.

Fosroc Flamex PU is a polyurethane based sealant with limited intumescent function. It has achieved a rating of four hours fire resistance when used in expansion and construction joints in

masonry construction and tested in accordance with AS1530 Part 4. Therefore similar alternative sealants are considered sutiable.

5. ASSESSMENT

It is considered that the deviation in the heat output from the burner, below the lower limit permitted by the test standard, would not have led to a different group number as determined in Section 6 of this assessment.

Alternative sealants may be used provided they have limited intumescent function and have achieved at least four hours fire resistance when tested in accordance with AS1530 Part 4 or equivalent for expansion and construction joints in masonry construction.

6. BUILDING CODE OF AUSTRALIA

The assessed results were analysed in accordance with the BCA 2005 and the test specimen's material group number and smoke growth rate index determined in accordance with BCA 2005 Specification C1.10a Clause 3 and Specification A2.4 Clause 4.

6.1 Heat Release

BCA Specification C1.10a allows a Group Number to be determined by physical testing in accordance with AS ISO 9705.

AS ISO 9705 is a room fire test where the material or assembly is installed (in a representative manner to the intended end use) within a room with dimensions 3.6 m long x 2.4 m wide x 2.4 m high. The room has a single doorway sized opening measuring 2 m high x 0.8 m wide in the centre of one of the 2.4 m x 2.4 m walls. A propane gas burner located in the corner opposite the doorway wall exposes the wall corner junction to a flame. The burner heat output is set to 100 kW for 10 minutes after which it is increased to 300 kW for a further 10 minutes. The oxygen concentration in the combustion gases from the room is measured and the rate of heat release from the room is calculated. The 'time to flashover' is determined when the total rate of heat release (from the burner and from the material/assembly being tested) exceeds 1000 kW, after which the test is terminated.

The Group number for a material or assembly is determined based on the 'time to flashover' as follows:

- Group 1 – does not reach flashover during the test
- Group 2 – reaches flashover after 10 minutes
- Group 3 – reaches flashover after 2 minutes, and before 10 minutes
- Group 4 – reaches flashover within 2 minutes.

6.2 Smoke Production

To be determined by physical testing in accordance with AS ISO 9705 as above.

The Smoke Growth Rate Index (SMOGRA) is calculated in accordance with BCA 2004 Specification A2.4 Clause 4 as follows:

a. Measure the instantaneous rate of light obscuring smoke R_{inst} expressed in square metres per second (m^2/s) in the exhaust duct at not more than 6 second intervals in the AS ISO9705 room test.
b. Determine the 60 second running average (R_{60}) at time *t*. The result is the average rate of light obscuring smoke over the period t-30 to t+30 seconds (in m^2/s).

$$R_{60} = \frac{1}{60}\int_{t-30}^{t+30} R_{inst}\,dt$$

c. Find the time (in seconds) at which the maximum value of the 60 second running average occurs. (t_{60}).
d. Calculate the $SMOGRA_{RC}$ index (in m^2/s^2 x 1000)

$$SMOGRA_{RC} = \frac{1000 R_{60}}{t_{60}}$$

The $SMOGRA_{RC}$ index is based on the results of a single test.

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6.3 Building Code Classification

A room/corner fire test was conducted to ISO 9705 - 1993 with the surface linings comprising three walls and the ceiling lined with nominally 100 mm thick XFlam polystyrene insulated panel.

The rate of heat release (including burner) did not exceed 1 MW during the 20 minutes of the test, and therefore the product is classified as 'Material Group 1' according to BCA 2005 Specification C1.10a Clause 3.

The maximum value of the 60-second running average smoke production rate was determined to be 1.7 m^2/s at 780 seconds and therefore the smoke growth rate index ($SMOGRA_{RC}$), calculated in accordance with BCA 2005 Specification A2.4 Clause 4 is 2.2 (m^2/s^2 x 1000).

7. CONCLUSION

It is concluded that for the purposes of compliance with the BCA 2005 Specification C1.10a for the Classification of Fire Performance of Wall and Ceiling Lining Materials, the product described below would have achieved the following classification if the burner output had remained within the prescribed limits for the duration of the test.

Product	**Classification**
XFlam polystyrene insulated panel (nominally 100 mm thick) with construction and installation details as described in BRANZ Test Report FI3443 dated 20 July 2005.	Group 1

The smoke growth rate index ($SMOGRA_{RC}$) for the sample was 2.2 (m^2/s^2 x 1000).

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