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APPROVAL REPORT

XFLAM CORE INSULATED PANELS WITH ALTERNATE XFLAM POLYSTYRENE/PHENOLIC FOAM

Prepared for:

**Austral Comnia Holdings Pty Ltd
40 Montclair Avenue, Level 1, Suite 12
Glen Waverley, Victoria
Australia 3150**


Project ID: 3029819

Class: 4880

Date of Approval:

June 4, 2008

Authorized by:


R. P. Ferron, P.E., A.V.P., Group Manager

**XFLAM CORE INSULATED PANELS WITH
ALTERNATE XFLAM POLYSTYRENE/PHENOLIC FOAM**

from

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I INTRODUCTION

- 1.1 Austral Comnia Holdings Pty Ltd submitted an alternate Xflam polystyrene/phenolic foam produced with a modified formulation to determine if insulated wall and ceiling panels produced with the alternate polystyrene/phenolic foam continue to meet the Approval requirements of the **Standard** listed below for Class 1 insulated wall and ceiling panels for installation to the maximum height of 9.1 m (30 ft).
- 1.2 Previous tests have been conducted with insulated wall and ceiling panels produced with the previously Approved Xflam polystyrene/phenolic foam. See FM Approvals Report for Project ID 3025087 dated April 16, 2007 for details.
- 1.3 This Report may be reproduced only in its entirety and without modification.

1.4 Standards:

Title	Class Number	Date
Approval Standard for Class 1 Insulated Wall or Wall & Roof/Ceiling Panels, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems and Interior or Interior Finish Systems	4880	October, 2005

- 1.5 Examination included a flammability characterization using the FM Approvals 50 kW Scale Flammability Apparatus and small-scale foam identification testing of the alternate Xflam polystyrene/phenolic foam produced with the modified formulation.
- 1.6 Tests show that Xflam Core insulated panels with minimum 0.6 mm (0.0236 in.) prefinished galvanized steel facers and maximum 10 in. (250 mm) thick alternate Xflam polystyrene/phenolic foam cores produced with the modified formulation, as tested, continue to meet the Approval requirements of the **Standard** listed above for Class 1 interior insulated wall and ceiling panels for installation to the maximum height of 9.1 m (30 ft).
- 1.7 **Listings:** The tested constructions meet the Approval criteria of FM Approvals when installed as specified in the **CONCLUSIONS** of this report and when Approval is effective will be listed in the Approval Guide, a publication of FM Approvals.

II DESCRIPTION

- 2.1 Xflam Core insulated panels consist of minimum 0.6 mm (0.0236 in.) prefinished galvanized steel facers adhered to maximum 250 mm (10 in.) thick Xflam polystyrene/phenolic foam cores or alternate Xflam polystyrene/phenolic foam cores with a two part polyurethane adhesive. Panels are available in various lengths with a coverage width of 1200 mm (47.25 in.). Panel side joints are double tongue and groove slip joints with sealant. Panel joints other than slip joints are covered with 1.2 mm (0.0472 in.) painted (optional) galvanized steel trim. Panel specifications and drawings are on file at FM Approvals.
- 2.2 The alternate Xflam polystyrene/phenolic foam cores consist of expanded polystyrene foam beads mixed with phenolic resin and modifiers and cured. Cured foam blocks are cut to the length, width and thickness required for the finished panels. The formulation and specifications are on file at FM Approvals.
- 2.3 The two part polyurethane adhesive used to adhere the prefinished galvanized steel facers to the alternate Xflam polystyrene/phenolic foam cores consists of A component (isocyanate) and a B component (polyol) which are mixed together and applied to the backside of the prefinished galvanized steel facers before mating with the Xflam polystyrene/phenolic foam cores. The identity of the A and B components, the ratio at which they are mixed and the application rate are on file at FM Approvals.

III EXAMINATIONS AND TESTS

- 3.1 Samples were submitted for examination and testing as follows:
 - 3.1.1 Tests conducted were as required by the **Standard** listed in paragraph 1.4 above.
 - 3.1.2 Production of sample alternate Xflam polystyrene/phenolic foam cores was witnessed by a representative of FM Approvals at the Xflam Pty Ltd production facility in Dandenong South, Victoria, Australia on November 11, 2007. All samples were considered representative of standard production and were examined and tested as indicated below.
 - 3.1.3 Test samples were selected and prepared by FM Approvals personnel. All testing was conducted at the FM Global Research Campus in West Glocester, RI.
 - 3.1.4 All data is on file at FM Approvals under Project ID 3029819 along with other documents and correspondence applicable to this program.
- 3.2 Flammability Characterization
 - 3.2.1 A series of measurements was made in the 50 kW FM Approvals Flammability Apparatus to determine the material flammability properties of the witnessed samples.
 - 3.2.1.1 The critical heat flux for ignition (q''_{cr}) and the thermal response parameter (TRP) were determined by exposing the coated surfaces of several samples to known radiant heat fluxes and recording the time to piloted ignition. The inverse square root of the time to ignition was plotted against the

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applied external radiant heat flux. The intercept on the applied heat flux axis is defined as the critical heat flux for ignition (the value of the external heat flux at or below which the sample can no longer achieve piloted ignition during the 15 minute exposure). The inverse of the slope at large external heat fluxes is the thermal response parameter (a measure of the thermal inertia of the material).

- 3.2.1.2 The chemical heat of combustion (ΔH_{ch}) and the effective heat of gasification (L_e) were determined by measuring the sample mass loss and heat generation rate history during exposure of a sample to an external heat flux of 50 kW/m². The chemical heat of combustion was obtained by measuring the chemical heat release rate by CO/CO₂ generation at the applied external heat flux, time integrating to obtain the total energy released and dividing by the total mass lost. The effective heat of gasification was obtained from the chemical heat release rate, the chemical heat of combustion and the net heat flux which was assumed to be the difference between external heat flux and the critical heat flux for ignition.
- 3.2.1.3 The convective flame spread parameter (FSP_c) was determined from the 5 second averaged peak convective heat release at an external heat flux of 50 kW/m², the sample area and the TRP.
- 3.2.1.4 Performance in the 50 kW FM Approvals Flammability Apparatus is considered acceptable if the FSP_c is 0.39 s^{-1/2} or less. A FSP_c of 0.39 s^{-1/2} or less for the thermoset plastic foam cores of insulated steel clad wall and ceiling panels has been found to correlate with the successful performance of thermoset plastic insulated steel clad wall and ceiling panels in the FM Approvals 7.6 m (25 ft) High Corner Test.
- 3.2.2 Test specimens were removed from 150 mm (6 in.) thick by 1220 mm (48 in.) wide by 1220 mm (48 in.) thick witnessed sample of alternate Xflam polystyrene/phenolic core foam without facers produced with the modified formulation. Each test specimen was coated with a high absorptivity selective black coating prior to placement in the sample holder of the 50 kW FM Approvals Flammability Apparatus.
- 3.2.3 The material flammability properties of the witnessed alternate Xflam polystyrene/phenolic foam test sample were as follows. The Class 1 limit and the material flammability properties of previously Approved Xflam polystyrene/phenolic foam are given for comparison.

	Xflam Polystyrene/Phenolic Foam (Project ID 3025087)	Alternate Xflam Polystyrene/Phenolic Foam	Class 1 Limit
ΔH_{ch} (kJ/g)	24.36	28.82	-
q''_{cr} (kW/m ²)	20	21	-
TRP (kW/m ² s ^{-1/2})	116	132	-
FSP _c (s ^{-1/2})	0.34	0.32	0.39

The performance of the witnessed alternate Xflam foam test sample produced with the modified formulation in the Approvals 50 kW FM Approvals Flammability Apparatus compares favorably with the Class 1 limit and that the previously Approved Xflam foam.

3.3 Heat of Combustion

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3.3.1 The heat of combustion of witnessed alternate Xflam polystyrene/phenolic foam without facers was determined in accordance with ISO 1716:2002: Reaction-To-Fire Tests for Building Products - Determination of the Heat of Combustion.

3.3.2 Three test specimens were removed from a 150 mm (6 in.) thick by 1220 mm (48 in.) wide by 1220 mm (48 in.) long sample of witnessed alternate Xflam polystyrene/phenolic foam without facers produced with the modified formulation.

3.3.3 The average heat of combustion of the three test specimens was 29.5 MJ/kg (12,700 Btu/lb)

3.4 Ignition Properties

3.4.1 The ignition properties of witnessed alternate Xflam polystyrene/phenolic foam without facers were determined in accordance with ASTM D1929-(2001)e1, Standard Test Method for Determining Ignition Temperature of Plastics.

3.4.2 Test specimens were removed from a 150 mm (6 in.) thick by 1220 mm (48 in.) wide by 1220 mm (48 in.) long sample of witnessed alternate Xflam polystyrene/phenolic foam without facers produced with the modified formulation.

3.4.3 The ignition properties of the test specimens were as follows:

Flash-ignition temperature	410°C (770°F)
Self-ignition temperature	462°C (865°F)

3.5 Ignition Residue

3.5.1 The ignition residue of witnessed alternate Xflam polystyrene/phenolic foam without facers was determined in accordance with ASTM D482-03, Standard Test Method for Ash from Petroleum Products.

3.5.2 Test specimens were removed from a 150 mm (6 in.) thick by 1220 mm (48 in.) wide by 1220 mm (48 in.) long sample of witnessed alternate Xflam polystyrene/phenolic foam without facers produced with the modified formulation.

3.5.3 The residue left after ignition of the test specimens was 5.5% by weight.

3.6 Apparent Density

3.6.1 The apparent density of witnessed alternate Xflam polystyrene/phenolic foam without facers was determined in accordance with ASTM D1622-03, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

3.6.2 A test specimen was removed from a 150 mm (6 in.) thick by 1220 mm (48 in.) wide by 1220 mm (48 in.) long sample of witnessed alternate Xflam polystyrene/phenolic foam without facers produced with the modified formulation.

3.6.3 The apparent density of the sample was 37 kg/m³ (2.3 lb/ft³).

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IV MARKING

- 4.1 The manufacturer shall mark each sheet or packing container of Xflam polystyrene/phenolic foam core with at least one label. In the case of bulk shipments, the bill of lading shall be labeled with at least one label. The Recognized Component label shall include the following:

PRODUCT TRADE NAME
MANUFACTURER'S NAME
FM APPROVALS LISTED
IDENTIFIED COMPONENT (Xflam Foam Core)

- 4.2 Recognized Component labels shall be applied by the manufacturer only within and on the premises of manufacturing locations that are under the FM Approvals Facilities and Procedures Audit program.
- 4.3 The manufacturer agrees that use of the FM Approvals name or Recognized Component labels is subject to the conditions and limitations of the Approval by FM Approvals. Such conditions and limitations must be included in all references to Approval by FM Approvals.

V REMARKS

Alternate Xflam polystyrene/phenolic core foam produced with the modified formulation has not been evaluated for the toxicity of the products of combustion.

VI FACILITIES AND PROCEDURES AUDITS

The Austral Comnia Holdings Pty Ltd manufacturing location at Xflam Pty Ltd in Dandenong South, Victoria, Australia is subject to periodic audit inspections to determine that the quality and uniformity of the materials have been maintained and will provide the same level of performance as originally Approved. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this report.

VII MANUFACTURER'S RESPONSIBILITIES

- 7.1 To assure compliance with his procedures in the field, the manufacturer shall supply to the panel manufacturer such necessary instruction or assistance required to produce the desired performance achieved in the tests.
- 7.2 The manufacturer shall notify FM Approvals of any planned change in the Approved product, prior to general sale or distribution, using Form 797, Approved Product Revision Report.

VIII DOCUMENTATION

The following document describes the alternate Xflam polystyrene/phenolic foam.

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Document	Issue or Revision	Description
Facilities and Procedures Audit Manual for Xflam Polystyrene/Phenolic Foam Cores	Revised 5/30/08	F&PA Manual

IX CONCLUSIONS

- 9.1 Test results indicate that insulated wall & ceiling panels produced with minimum 0.6 mm (0.0236 in.) pre-finished galvanized steel facers and maximum 250 mm (10 in.) thick alternate Xflam polystyrene/phenolic foam cores produced with the modified formulation continue to meet the Approval requirements of the **Standard** listed above for Class 1 insulated wall and ceiling panels for installation to the maximum height of 9.1 m (30 ft) when installed as required by the Austral Comnia Holdings Pty Ltd listing in the current edition of the Approval Guide, a publication of FM Approvals.
- 9.2 Tests show 1) that the panels in and of themselves would not create a need for automatic sprinklers and 2) that the panels would be acceptable in a combustibile occupancy protected by automatic sprinklers as defined by FM Global Loss Prevention Standards.
- 9.3 Since a duly signed Master Agreement is on file for this customer, Approval is effective as of the date of this report.
- 9.4 Continued Approval will depend upon satisfactory field experience and periodic Facilities and Procedures Audits.

TESTING SUPERVISED BY:

J. M. Goodwillie, Jr.

PROJECT DATA RECORD:

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ORIGINAL TEST DATA:

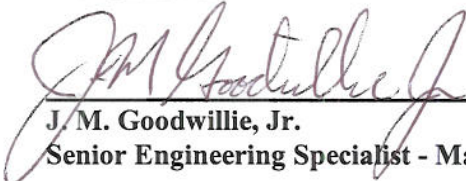
PDR for Project ID 3029819

ATTACHMENTS:


None

REPORT BY:

REPORT REVIEWED BY:



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Technical Team Manger - Materials Group