

Insulated Sandwich Panels And “FM Approved”

FM approved, or a listing in FM Approvals' *Approval Guide*, of building materials like Insulated sandwich panels, appear to mean many things to many people with some broad assumptions being made. The reality is that for a manufacturer to get a listing for their product as FM Approved, there are a lot of choices that have to be made based on the product's market potential and where the manufacturer sees their product fitting in the overall scheme of things.

Manufacturers can choose the combination of FM Approved listings they want to go for from the following –

- a. The density of the core material.
- b. The maximum thickness of the panel.
- c. Walls only application
- d. Walls and ceiling combination
- e. Maximum wall heights of 9.1m, 15.2m or unlimited height
- f. Roof Panels

As from 2005 there will be a further approvals option for –

- g. Exterior wall panels

All of these FM Approved listings require different and/or additional fire and applications testing to be done to get their approval and listing as explained below.

a. Core density. (All relevant FM Approval Standards)

Depending on the material used, the denser the core material, the better the performance in the various fire tests involved. Where a manufacturer wishes a core material of two or more densities to be approved, in most cases for polyurethane/polyisocyanurate foam cores, the lowest will be tested and that will be the minimum density listed.

With mineral wool, stone wool or glass fiber core materials it is the maximum density that is tested and listed

With the polystyrene/phenolic core materials, a lower density could increase the potential combustibility of the core material (larger polystyrene beads and less phenolic). Since this is a very new material with little fire testing done, fire testing of all densities requested to be listed would be done to ensure meaningful listings.

b. Maximum panel thickness (All relevant FM Approval Standards)

This is entirely the manufacturer's call based on their market research and target applications. They can range from as thin as 50mm right up to 250mm or more. The key here is that the thickest panel that is to be listed, is the one that is used in the FM Approvals 7.6m (25ft) Corner test and the UBC or ISO 9705 Room Corner Test (maximum potential combustible loading).

c. Walls only application (FM Approval Standard 4880)

In the approval process for insulated sandwich panels, all the core materials are subjected to two different tests in the FM Approvals 50 kW Scale flammability apparatus (advanced cone calorimeter type test) to develop a convective flame spread parameter - FSPc. If the FSPc is less than 0.39, and the panel facings are non combustible (steel or Aluminium) FM Research has already determined a very accurate correlation with the FM Approvals 7.6m (25ft) high corner test whereby they know the core material in question (with non combustible facings) would pass and therefore this test is not required for approval of this specific product. Where an insulated sandwich panels has any sort of combustible facings, then the FM Approvals 7.6m (25ft) corner test must be run.

If the FSPc is greater than 0.39 and non combustible facing used, then the core material in question is borderline and the manufacturer has the option of doing the FM Approvals 7.6m (25ft) high corner test and if successful would obtain approval. FM Approvals would not recommend testing any sandwich panel (non combustible faced) with a core material with an FSPc over 0.45.

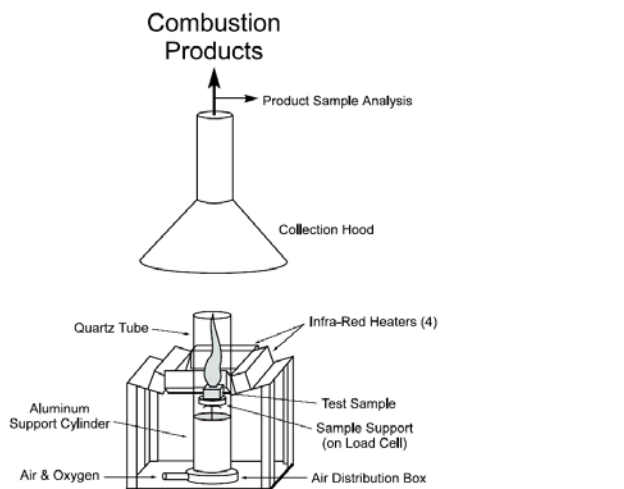


Figure C-1. FM Approvals 50 kW Scale Flammability Apparatus

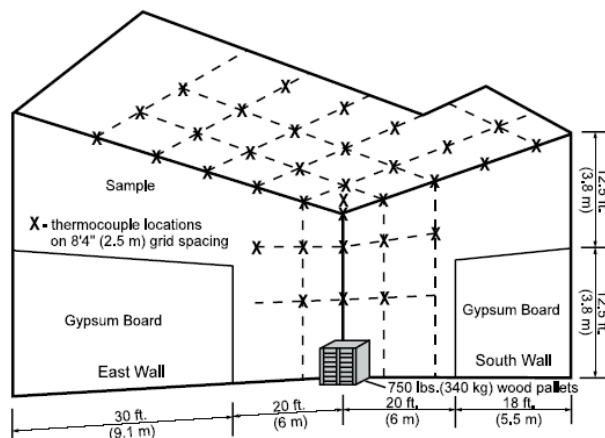
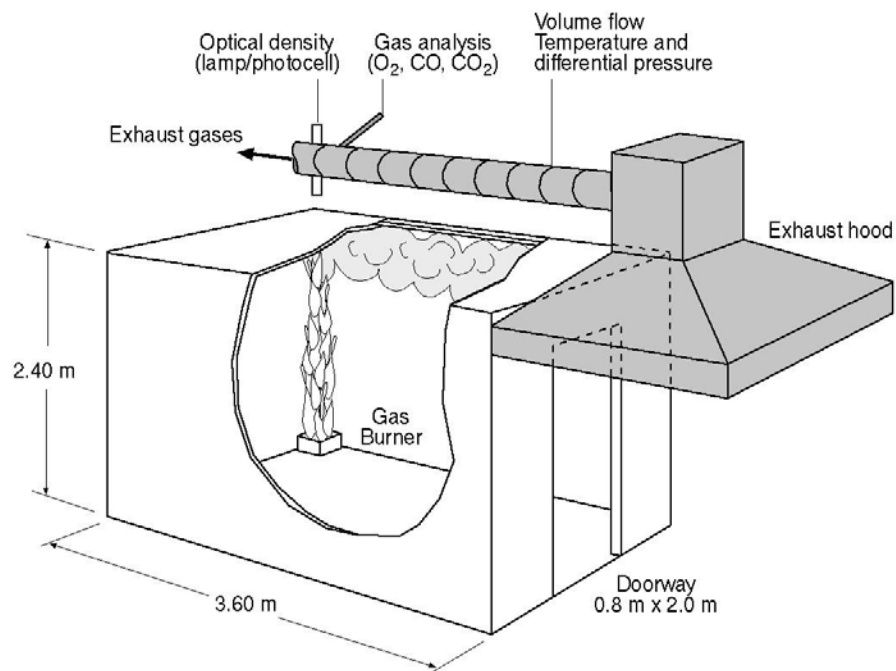


Figure D-1. 25 ft (7.6 m) Corner Test Structure

All insulated panels regardless of their FSPc, must be tested in the UBC Room Corner test or the ISO 9705 Room Corner test (much more severe than the UBC

test), since FM Research has not determine a conclusive correlation between the FSPc and the room corner test behavior which is much more complex than the large FM Approvals 7.6m (25ft) high corner test. For the Room Corner tests, the requirements for FM Approval in relation to pass or fail criteria are much more stringent than those of the Building Code of Australia BCA; that is, – no flaming evident at the edges of the panels in the room, and no thermoplastic behavior of the core material (melting) rather than the relatively simple time to flashover criteria of the BCA.

If the manufacturer requests a walls only listing, then the FM Approvals 7.6m (25ft) high corner test if needed, and the UBC or ISO 9705 Room Corner Test, are run with the panel installed on the walls only in conjunction with a non combustible (gypsum board) ceiling for the UBC or ISO 9705 room test, and steel roofing with gypsum board ceiling in the FM Approvals 7.6m (25ft) corner test. If the product passes then the FM Approval and Listing is limited to this application only, and if the product in question is used as a ceiling, the installation in question is Not FM Approved since it has not been fire tested in the ceiling application.



ISO 9705 Room Corner Test

The UBC room test has similar configuration except 2 walls instead of 3 (and ceiling where that configuration is tested), lined with the insulated sandwich panel, and a wood crib is used as the exposure fire

d. Walls and ceiling combination (FM Approval Standard 4880)

Where this FM Approved listing is requested, then the Room corner test and if needed the FM Approvals 7.6m (25ft) high corner test are run with panels installed on both the walls and ceiling.

e. Maximum wall heights of 9.1m, 15.2m and unlimited height (FM Approval Standard 4880)

9.1m high limitation

For non combustible faced sandwich panels using core materials with an FSPc less than 0.39, a satisfactory room corner test on the insulated sandwich panel system, automatically achieves an approval for wall heights of up to 9.1m. (because of the acceptable correlation between FSPc and the FM Approvals 7.6m (25ft) high corner test).

For core materials with FSPc over 0.39 and combustible faced sandwich panels, an FM Approvals 7.6m (25ft) high corner test must be passed successfully to get FM Approved listing for applications to 9.1m.

15.2m high limitation

To achieve FM Approved listing for wall heights up to 15.2m, the insulated sandwich panel system must undergo the larger scale FM Approvals 15.2m (50ft) high corner test.

For walls only listings, a non combustible ceiling is installed, and the pass criteria is no flaming evident at the edges of the installation (typically at the wall/ceiling joint).

For wall and ceiling listings, the same pass criteria applies.

Unlimited height

For unlimited height listing, the same FM Approvals 15.2m (50ft) high corner test is used, however in this case the pass criteria requires no flaming evident on the ceiling.

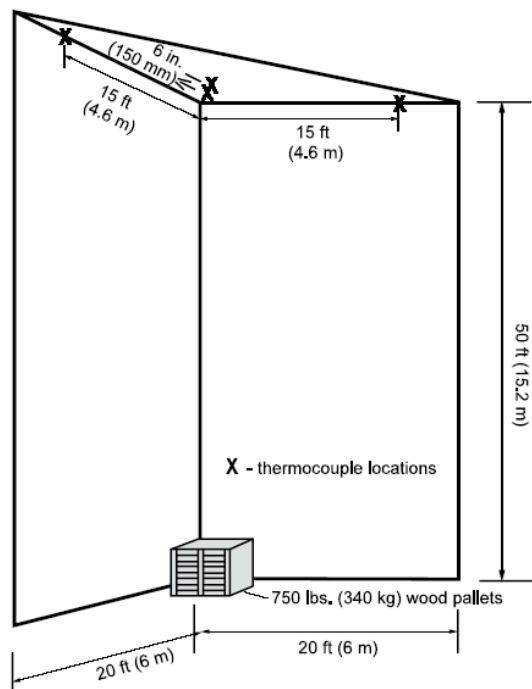


Figure E-1. 50 ft (15.2 m) Corner Test Structure

f. Roof Panels (FM Approval Standard 4471)

This category has been listed since 1995 and requires the following testing to be done –

1. Combustibility – from below the roof assembly

If the insulated sandwich panel system has already passed all requirements of FM approval standard 4880, no further testing is needed. If not then the FM Approvals Construction Calorimeter test is required.

2. Combustibility – from above the roof assembly

In this case the ASTM E 108 Fire test of Roof Covering for A, B or C exposures is used – A being severe down to C light exposure.

3. Wind Uplift Resistance

Here the insulated sandwich panel roof assembly is subjected to increasing uplift pressure – cycled, through to failure to determine the actual rating.

4. Foot Traffic Resistance

5. Hail Resistance

6. Water Leakage Resistance

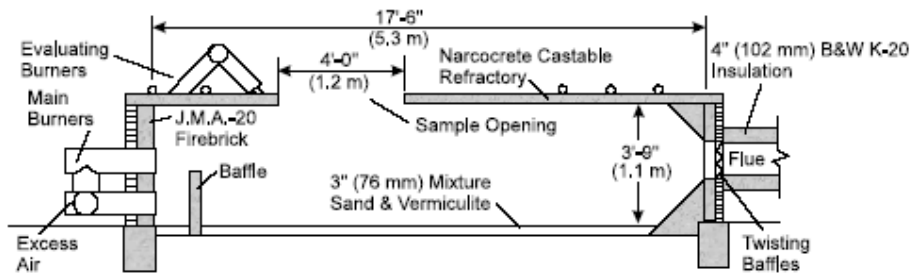


Figure C-1. Dimensions and Construction Details of the Calorimeter

Test for combustibility from a fire exposure below the roof



ASTM E 108 Fire Test of Roof Covering

Test for combustibility from a fire exposure above the roof



Wind Uplift Test Rig

g. Exterior Wall Panels (FM Approval Standard 4881)

This category will start to be listed in 2005 and has been introduced to take care of high wind exposures, typically for cyclone/hurricane areas but just as applicable for anywhere in Australia where we see high wind speeds associated with thunderstorms. The listing will include a number of wind speeds that the panels would be able to resist.

Apart from the fire testing for the FM Approved listings above, the insulated sandwich panel system to be used as external cladding will be subject to wind load resistance testing (the same apparatus as for wind uplift resistance is used), impact resistance (wind borne objects) and hail resistance testing.

Installation of FM Approved Insulated Panels

FM Approved is only valid for the actual listed insulated sandwich panel system up to the maximum listed thickness, installed either walls only or walls and ceilings (as listed) to the maximum heights per their listing. On top of that the listing also includes details of the skin type (steel or aluminium), skin thickness, corner and joint trim (steel or aluminium and their respective sizes and thickness and fixing – screws, steel pop rivets, etc), attachment to structural members, etc. One such complete listing is shown below.

FM Approved for an insulated sandwich panel system is only valid when the FM Approved panel is installed exactly as fire tested which is covered in the listing details in the *Approval Guide*. The information in the listing is only a précis of the manufacturer's installation manual which must be followed exactly to have an FM Approved system. No deviations are allowed since the panel's fire performance can no longer be guaranteed.

Sample Listing from the *Approval Guide*

Wall-Ceiling Construction

FM Approvals Standard 4880 (1994)

Metal-faced with Noncombustible Core Class 1 Fire Rated with No Height Restriction

[Hunter Douglas Construction Elements BV, Industriepark 17, Box 128, 9350 AC Leek, The Netherlands](#)

Luxalon Insulated Building Panels with max 100 mm (4 in.) thick mineral wool core (9.7 ± 1.1 lb/ft³ (155 ± 17 kg/m³) density) and min 0.7 mm (0.028 in.) thick precoated steel facings. Panels are secured to the substrate with concealed clips and fasteners (one fastener per clip). Panel side joints are tongue and groove (Bi-Modular SWH60151) available with steel or PVC connectors. Steel connectors require a rubber gasket sealant and PVC connectors require a Promaseal PL intumescent gasket sealant. Panels may be installed in a vertical or horizontal orientation. Panels may be provided with precoated min 0.7 mm (0.028 in.) thick aluminum facer on one side when the aluminum facer is installed on the exterior of a building. The facings of the panels must be positively secured to the mineral wool core by 1) securement of the entire panel assembly to supporting structural members with mechanical fasteners or 2) positive securement of the interior panel facer to the exterior panel facer with mechanical fasteners.

Specific Details on the Insulated Panels currently listed in the Buyers Guide as FM Approved. (As at November 2004)

Manufacturer	Product	Distributor	Category	Max Thickness	Application	Height
Eurobond	Firemaster	Eurobond Pacific	Stone Wool	160mm	Walls Only	Unlimited
Eurobond	Eurofoam	Eurobond Pacific	PIR	200mm	Walls & Ceiling	9.1m
Hunter Douglas	Luxalon	NA	Stone Wool	100mm	Walls & Ceiling	Unlimited
Kingspan	KS 1000 RWFM	Kingspan Australia	PIR	100mm	Wall & Ceiling	Unlimited
Kingspan	KS900,1000,1200 AWP	Kingspan Australia	PIR	100mm	Walls only	Unlimited
Metecno API	AP 300	Bondor Aust.	PU	150mm	Walls & Ceiling	Unlimited
Metecno API	AP 900	Bondor Aust.	PU	150mm	Walls & Ceiling	Unlimited
PAROC	Paroc Panel Systems	CSR Panel Systems	Mineral Wool	240mm	Walls & Ceiling	Unlimited

Note 1 - Polypanel Industries and Retracom purchase FM Approved panel from others per buyers request

Note 2 - There are other manufacturers in the Buyers Guide that are in the process of obtaining an FM Approved listing

Core Material Suppliers

Currently there is no FM Approved Listing Category for Core materials that can be used for insulated panels. Approval is determined for each insulated sandwich panel system based on the core/skin/joint and installation detail combination.

This means that a panel manufacturer cannot simply buy core material that has been used in an FM Approved and listed insulated panel system, and laminate their own insulated sandwich panels and assume they are also FM Approved.

The only proviso here is that if an insulated panel manufacturer goes through the appropriate FM Approvals' process, has a complete FM Approvals' audit (Quality control procedures), has all the insulated sandwich panel system design, specifications and installation manual reviewed AND chooses to use a core material that has already been used in FM Approved listed insulated sandwich panel systems, then there is scope for not requiring some or all of the fire testing

to be done. This can only happen if the core manufacturer formally agrees to release all the FM Approvals' fire test data to be used for the insulated sandwich panel manufacturer's FM Approved application.

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FM Global

References

TBG03 - Alliance Technical Buyers Guide
FM Approval Standard 4880 Class 1 Insulated Wall or Wall & Roof/Ceiling
Panels
FM Approval Standard 4881 Class 1 Exterior Wall Systems
FM Approval Standard 4471 Class 1 Panel Roofs
ASTM Fire Test Standards 5th edition