

THE USE OF SANDWICH PANELS IN BUILDING CONSTRUCTION

Fire and Security Consulting Services (FSCS) is frequently consulted on the use of sandwich panels in building construction.

Sandwich Panels are constructed from a core of lightweight aerated material between two metal, either steel or aluminum, surfaces.

The three most common are , EPS, being expanded polystyrene, PIR being polyisocyanurate and ignition retarded EPS (XFlam)

EPS

The EPS core sandwich panel consists of two sheets of steel with EPS sandwiched in the middle. Its thickness can range from 100 to 250 mm, depending upon how it is used.

The expanded polystyrene foam that makes up the panel core is usually of fire retardant grade. This means that it will resist catching alight when exposed to small ignition sources such as matches, small electrical arcing and welding slag. The fire retardant works on the principle of binding to the ionized vapourised reactants (fuel), preventing them from participating in the combustion reaction.

This fire retardant process is overwhelmed when the quantity of fuel vapourised becomes significant.

Melting point

Softens at 150°C and melts at 200°C

Piloted ignition temperature (flash point)

360°C to 380°C

Auto-ignition temperature

500°C

Critical heat flux

13kW/m²

Net heat of complete combustion

39.2kJ/g

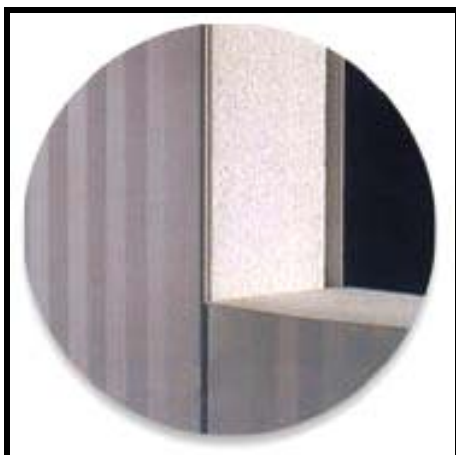


Figure 1 – Typical EPS panel

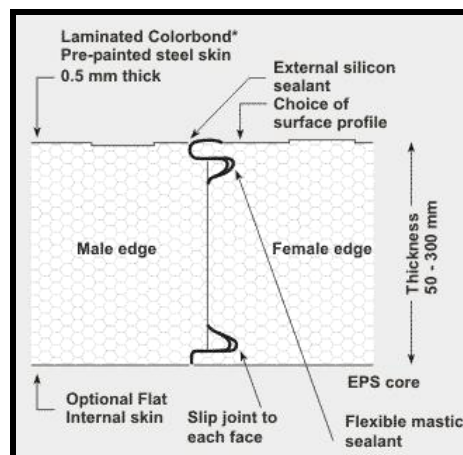


Figure 2 - Typical EPS panel

The consequences of fire involving the PS sandwich panels are of concern to both occupant safety and the ability of fire fighters to control and extinguish a fire. However occupant safety considerations are driven more by the building's combustible loading and consideration of the implications of sandwich panel fires and failure is more relevant in Fire Brigade Intervention.

PIR

PIR is very difficult to ignite. Typically when a high intensity propane torch is applied to exposed PIR after the metal facings have been removed, the propane torch generates a temperature of over 1,000°C.

Figures 3 and 4 show the effect to PIR after 30 minutes exposure to a naked flame. The PIR forms a strong char that protects the core foam from ignition. When the burner is removed after 30 minutes the core self-extinguishes.

The above text and photographs below are taken from the brochure "Property and Business Fire protection" published by Kingspan Insulated Panels Ltd.)



Figure 3



Figure 4

Consequently it is assessed that with correct installation methods and ongoing maintenance, the PIR panels are not considered to the fire load.

XFlam

XFlam is based on syntactic technology, using specific Phenolic resins with various filling materials to provide the necessary properties of the composite blend. Various filling materials are used in XFlam insulation products, including EPS bead and other specialist polymeric substances to provide enhanced fire resistance.

Figure 5 below shows testing for piloted ignition of a "naked" XFlam core which demonstrates little or no ignitability.

Consequently it is assessed that with correct installation methods and ongoing maintenance, the XFlam panels are not considered to add to the fire load.



Figure 3.5 – XFlam Ignitability

The above text and photograph are taken from the XFlam website - www.XFlam.com

Fire Brigade Attitude

Certifiers should be aware of the fact that QFRS Building Approval Officers are increasing aware of the implications of the effects of fire on sandwich panel construction. There have been many fires in buildings with EPS panels, some of which have resulted in firefighter fatalities.

Accordingly BCA E1.10, reproduced below, may be imposed on the building.

E1.10	Provision for special hazards
	Suitable additional provision must be made if special problems of fighting fire could arise because of-
	(a) the nature or quantity of materials stored, displayed or used in a building or on the allotment; or
	(b) the location of the building in relation to a water supply for fire-fighting purposes.

Comparison off Sandwich Panels

Figure 6 below is a summary of commonly used insulated sandwich panels prepared by Insurance Underwriters associated with FSCS on projects. It shows that the PIR and Xflam products have “good” fire performance, will not propagate fire if flame is removed, will char rather than burn and do not need sprinklers for the “panels themselves”.

Table 1. Insulated Panel Property Comparison

	Kingspan Panel	Bondor MetecnoPanel	Austral Xflam	Standard Panels
Insulative Material	Polyisocyanurate (PIR)	Polyisocyanurate (PIR)	Expanded Polystyrene (EPS) with Phenolic Chemical treatment	Expanded Polystyrene (EPS)
FM Approval	Yes - unlimited heights	Yes - unlimited heights	Yes - up to 9.1 metres	No
Fire Performance	Good - If flame removed from panel, fire will not propagate. PIR chars rather than burns	Good - If flame removed from panel, fire will not propagate. PIR chars rather than burns	Good - If flame removed from panel, fire will not propagate. Xflam chars rather than burns	Extremely poor - If flame removed from panel, fire will continue to burn through EPS
R-Value (50 mm nominal panel thickness)	2.65	2.4	1.61	1.32
Sprinklers Rqd for Panels Themselves	No	No	No	Yes
Costs	Contact Suppliers	Contact Suppliers	Contact Suppliers	Contact Suppliers
Availability	Made in NSW, Australia	Made in QLD, Australia	Made in VIC, Australia	Made throughout Australia

Figure 6 – Insulated Panel Performance

I trust that this paper provides information that you will find helpful.

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