

TECHNICAL GUIDANCE NOTE - 002

Sandwich panels – what are they?

Sandwich panels are typically single piece, modular, factory engineered units comprising two metal faces and a fully insulating core.

The facings are fully bonded to the core so that the panel acts compositely when under load, in most cases, providing free standing panels. Facings used for insulated panels are predominantly of steel. The core material is usually a material that provides good thermal insulation properties. The insulating core is typically bonded to the facings using a conventional adhesive bond.

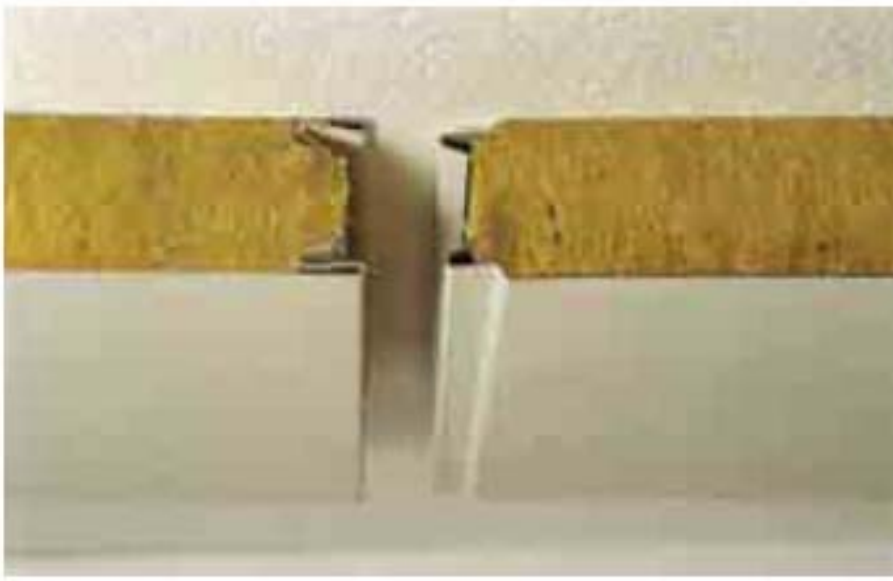


Figure 1: Section through a typical sandwich panel.
(Photo: Courtesy of Bondor).

Manufacturing processes

The panels are typically manufactured on a continuous production line, as shown below.



Figure 2: A continuous production line.
(Photo: Courtesy of Bondor).

Core Materials

For the purposes of this Technical Guidance Note, the following generic core material types have been considered:

- PUR
- PIR
- Mineral Wool / Stone Wool
- Phenolic foams
- EPS (Expanded polystyrene)
- Phenolic/EPS Composites
- Proprietary

The following sub sections provide a very basic overview on each generic core material type and some basic fire performance attributes for the generic core material type when considered in isolation, (not when incorporated within a sandwich panel).

Whilst this information is interesting and has been provided because questions like this are continually being asked of us at The Alliance for Fire & Smoke Containment, it should be stressed, that when the core material is incorporated into a steel faced insulated (sandwich) panel system, the protection provided by the metal facings, joints, fixings and the support system may greatly modify the fire performance indicated for the core insulation materials in isolation.

The practical performance of the complete and proprietary insulated panel system can only be evaluated by the use of full-scale fire tests.

The fire properties of core materials can vary significantly according to the generic type of insulating core and the specific proprietary formulation.

PUR – (Polyurethane)

Rigid polyurethane (PUR) materials are cellular thermosetting insulation materials that typically form a char when subject to heat and flame impingement. The char acts as an insulator that affords some protection to the underlying product. However, PUR will burn by charring and pyrolysing producing significant quantities of smoke in the process.

PIR – (Polyisocyanurate)

Rigid polyisocyanurate (PIR) insulation materials are created by the trimerisation of three molecules of the polymeric isocyanate used in their formulation. As a result, when tested in isolation, the rate of pyrolysis is reduced compared to PUR materials, the strength of the char is increased, and the protection to the underlying insulation is enhanced.

This results in the reduction of the amount of damage created by the incident of fire with a consequent reduction of smoke production.

Mineral Fibre / Stone wool (MF/SW)

Mineral fibre/stone wool insulating core materials are created from molten glass, stone or slag that is spun into a fibre like structure and bonded together using organic binders. When tested in isolation (to relevant standards such as AS1530 Part 1) the fibre performance is classified as non-combustible or at worst, of limited combustibility.

In terms of fire alone, mineral fibre/stone wool is a reliable fire protection material, since it is both non-combustible and does not conduct heat. This means that it will not propagate fire and can withstand temperatures above 1000°C. When incorporated within a sandwich panel structure mineral fibre/stone wool insulating core materials are suitable for a range of applications where fire retardant properties are essential, for example internal and external walls, ceilings and partitions.

Note – Often referred to as Rockwool® which is in fact a Proprietary type of Mineral Fibre technology

Phenolic foams

Phenolic foams contain a polymeric structure that offers a considerable resistance to degradation by heat. Accordingly, like PIR products they are thermosetting, forming a char in isolation which adds a high degree of protection to the underlying insulation.

The characteristics are maintained when the product is incorporated into insulated panels. Smoke production is also low by comparison with most other polymeric materials.

EPS – (Expanded Poly-Styrene)

Polystyrene is a thermoplastic that melts when subjected to excessive heat. Chemical flameretardants are typically added which do improve the fire performance, but when exposed to sustained flame impingement even these flame retardant polystyrene materials will burn and they typically produce large quantities of smoke.

The softening temperature is approximately 100°C and melting temperature 180°C. As the temperature increases the polystyrene melts and recedes from the heated surface creating a void.

Phenolic / EPS Composites

A relatively new development is the Phenolic - Expanded Polystyrene (EPS) hybrid core material. These composite materials, consisting of EPS beads encapsulated in a Phenolic matrix, they combine the fire performance and some relatively low smoke production properties of Phenolic core materials, as well as the thermal insulation properties of EPS core materials.

The introduction of the Phenolic matrix results in a core material of limited combustibility which experiences similar char characteristics to other thermosetting type plastic materials.

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Proprietary

Proprietary core materials are those which do not fall within the generic core material categories listed above.

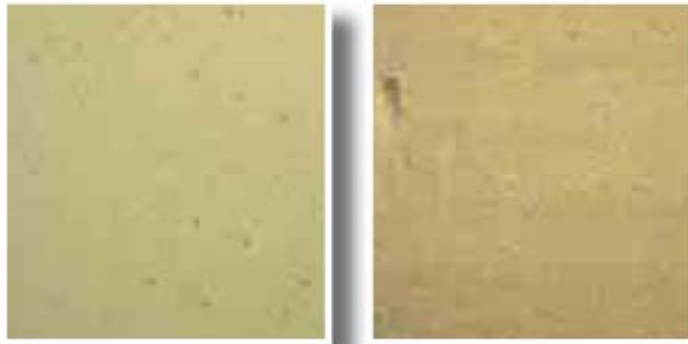
Core Identification Guide

These generic core materials discussed above typically have the following appearance (but note that these colours are representative only and are given as a very basic guide):

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EPS



PUR

PIR

Core Identification Guide (cont.)



MF/SW



Phenolic Foam



Phenolic/EPS Composites

This Technical Guidance Note (like others of its kind) has been prepared in good faith to provide some basic assistance to those who are not familiar with some relevant technical issues relating to Fire and Smoke Containment.

This document can be change without prior notification.