RiskFix

Balanced Risk Engineering Solutions

Sandwich Panels

Understanding the Risk

Sandwich panels (composite panels) consist of an insulation material core, of varying thickness, held between metal or plastic facings. They have been used extensively in external wall and roof construction for many years in a wide range of occupancies including cold storage, warehousing, food industry, hotels, exhibition halls and clean room environments as examples. They have also been used within buildings to form internal structures.

The main reasons for their popularity are:

- Good thermal insulating properties reducing heat and cold transmission
- Acoustic properties reducing sound transmission
- Lightweight
- Ease and speed of construction
- Ease of wash down - essential in certain industries
- Relative low cost when compared to some other forms of construction

These factors can reduce both construction and ongoing energy costs. However, the fire risks associated with some types of sandwich panels should be fully understood and taken into account, as building control legislation does not consider the full implications beyond life safety aspects.

The insulation core within sandwich panels varies. The core material used generally falls into one of the following categories:

- Non-combustible mineral wool or fiberglass.
- Polyisocyanurate foam (PIR)
- Polyurethane foam (PUR)
- Expanded or extruded polystyrene (EPS and EXPS)

From the above, it will be appreciated that some of the insulation core materials in common use are combustible. For the purpose of this document these will be referred to as Foam Insulated Sandwich Panels (FISP).

Some manufacturers have produced sandwich panels that have been subject to independent fire testing and approval (FM – Factory Mutual, LPCB – Loss Prevention Certification Board). This may not mean they are 'non-combustible' but does demonstrate an improved fire performance.

There have been numerous serious fires over the years, where FISP panels have been used in construction, resulting in significant loss of facilities and resultant business interruption consequences. The main detracting features of using a combustible or non-approved sandwich panels are as follows:

- Potential rapid fire spread within the panel
- Difficulty in fighting fire where the concealed core is involved
- Melting polystyrene core creating a spreading burning liquid fire
- Delamination of panels can occur exposing combustible core to direct fire impingement increasing the rate of fire spread
- Liberation of dense corrosive and toxic smoke

Due to the nature of fires involving combustible core sandwich panels (particularly EPS/XPS), the efforts by public fire brigades may only be limited to life safety operations and defensive fire fighting to prevent spread to adjacent properties. Additionally, even a relatively small contained incident could result in considerable smoke contamination and collateral damage to buildings, contents, stock, machinery and equipment with a high financial loss and disruption to the activity undertaken at the facility.

Controlling the Hazard

For new buildings, extensions or replacement, every effort should be made to use non-combustible core insulated sandwich panels such as mineral wool or fiberglass. Where this is not possible, as a minimum, a tested and approved (FM or LPCB) sandwich panel should be used. Ideally where foam core sandwich panels are already in existence (especially EPS/XPS), a programme of replacement should be considered.

In order to effectively control the fire hazard associated with sandwich panels it is necessary to have in place an effective combination of both human element and physical protection controls.

Human element controls relate to the management procedures aimed at reducing the likelihood of a fire occurring and ensuring an effective response in the event of a fire.

Physical protection controls relate to protection or design principles aimed at reducing or mitigating the effect in the event of a fire.

The issues detailed under these 2 headings should be considered fully, to create an integrated risk control programme.

Human Element

- Ensure management loss prevention programmes where sandwich panels present are robustly followed –i.e. good housekeeping, self-inspection, smoking regulations, emergency organisation.
- Identify and label all combustible core sandwich panels and regularly inspect for damage exposing the core. Where the core is exposed, it should be repaired promptly.
- Ensure combustibles and flammable liquids are not stored near panels
- Conduct infrared thermography inspections of electrical installations using qualified contractors in accordance with appropriate standards. Any deficiencies identified should be rectified.
- Implement an appropriate permit to work procedure whenever work is undertaken on or in the vicinity of sandwich panels. See appendix 1 for an example.

Physical Element

- Avoid the use of combustible core sandwich panels. Where this cannot be avoided, only use panels that have undergone an appropriate test and approval (i.e. FM or LPCB)

- Panels should be firmly fixed to the building frame in accordance with the manufacturers installation guidance to mitigate early delamination of the metal facing in a fire incident
- Where combustible core panels are already present, replacement should be considered at the earliest opportunity to comply with the first point above
- Provide automatic sprinkler protection to an appropriate standard (i.e. National Fire Protection Association - NFPA 13 or local equivalent as a minimum for occupancy
- Penetrations through the panel should be avoided but where they are necessary, cables or services that pass through should be contained within a non-combustible housing and opening sealed with fire-stopping materials
- Hazardous operations within the premises such as cooking should be contained within a fire-compartmented area with a minimum 1-hour fire resistance, including self-closing doors.
- Chimney or flue vents should not be directed through or located close to combustible panels. Where this cannot be avoided, 15cm of non-combustible insulation should be provided around the flue.
- All repairs to panels should be conducted as soon as discovered using fire retardant materials
- Impact skirting or crash barriers should be installed to mitigate physical damage
- Direct mounting of machinery and equipment, especially electrical should be prohibited.

References

LPCB - LPS1181: Requirements & Tests for LPCB Approval of Wall & Ceiling Lining Products and Composite Panels

LPCB - LPS1208: Fire Performance Standard for Metal Faced Fire Resisting Insulated Panels

For further information, contact your local AIG risk engineer.

Appendix 1 – Example FISP Work Permit

Foam Insulated Sandwich Panel Work Permit

Scope

This work permit is required for any temporary procedure or operations being carried out on Foam Insulated Sandwich Panels (FISP), to ensure fire safety procedures are in place before work commences. The work permit should be applied to employees or contractors and completed signed documents to be kept in file for future reference.

In view of the combustible nature of the insulation core, any procedure involving the generation of heat, sparks or use of open flame (welding, grinding, cutting, high speed drilling etc.) should be forbidden on or in close proximity to the panels.

Responsibility

Facilities Manager or Supervisor

- Ensure the FISP work permit is in place and adhered to when work is to be carried out on or in close proximity (within 10 metres) to foam insulated sandwich panels or exposed foam linings
- Ensure employees and contractors understand the scope and intent of the procedure
- Ensure the work is fully risk assessed and appropriate safe working methods adopted
- Ensure contactors engaged to carry out work on site have provided proof of current and adequate levels of public liability insurance cover prior to commencement of any work

Employees and Contractors

- Ensure employees and/or contractors involved in work have read, understood and fully adhere to the FISP procedures, precautions and work permit

Procedures and Precautions

1. No maintenance work should be undertaken on foam insulated sandwich panels without the prior approval of the appropriate designated and trained person in authority – facilities manager, supervisor or nominee. The work should only commence on issue of the FISP work permit
2. The FISP work permit should provide details of the area where the work is to be performed, the nature of the work, equipment to be used and who will perform the work
3. The FISP work permit should be issued by a designated and trained person in authority – facilities manager, supervisor or nominee
4. The signed and authorised FISP work permit must be prominently displayed at the site of the work
5. It is the responsibility of the person performing the work to ensure the FISP work permit has been completed and authorised prior to commencement of work.
6. The following precautions should be reviewed and considered during the risk assessment stage prior to establishing the safe working methods to be adopted. If it is agreed by the facilities manager, supervisor or nominated person that not all following precautions are required, they are to strike them out of the FISP work permit and initial the amendment before signing the document.

- **NO HOT WORK** to be undertaken on or in vicinity of foam insulated panels (where this cannot be totally avoided in the **vicinity of panels** and as a last resort only, strict controls must be enforced using an appropriate hot work permit with a continuous fire watch extending two hours after the work has finished – **no hot work should be conducted on the foam insulated panels.**)
- Where panels need to be cut, only cold cutting methods such as shearing (hand operated tools), low speed drills or hand tools are used.
- Secure fixings to panels using adhesives (water based where possible) or mechanical fasteners. Where flammable adhesives must be used, ensure that no hazardous ignition sources (i.e. battery chargers, electrical panels or spark producing equipment) are operating within the area (approximately 3 metres).

- Smoking and other ignition sources are not permitted during work on the panels.
- Pipe penetrations should be sealed with a metal facing mechanically clamped or riveted onto the metal face of the panel.
- Dispose of any panel off-cuts immediately. Waste panel material (especially cores) should be disposed of outside the building in a suitable waste bin situated at least 10 metres from the building.
- A suitable serviceable fire extinguisher or hose-reel should be available at all times during the work.
- All other fire protection/detection equipment (sprinklers, hose-reels, hydrants, fire alarm) should be in good working order.
- At the end of the work, ensure that any exposed core has been resealed with a metal capping.

Foam Insulated Sandwich Panel Work Permit

Before commencing work consider whether the job can be avoided.

When making penetrations through or undertaking cutting work involving foam insulated sandwich panels, it is important it is undertaken safely and the foam core not left exposed to avoid the risk of ignition and subsequent fire. Complying with this work permit will minimise the risk by ensuring the job is managed in a consistent manner in accordance with the necessary precautions.

Job Number:		
PERMIT DURATION & DETAILS *(not to exceed one shift)*		
Date:	Commencement Time:	Completion Time:
Work undertaken by:	❑ Employee ❑ Contractor	
Location/Area:		
Work Involved:		
Equipment Used:		
Personnel Involved:		

PRECAUTIONS CHECKLIST			
❒	No hot work to be undertaken	❒	Operating equipment shut down & isolated
❒	Sprinkler Protection in service	❒	Automatic fire alarm in service
❒	Fire extinguisher or hose reel available	❒	Personnel trained to use fire fighting equipment
❒	Work area clear of debris, combustibles and flammable materials/liquids	❒	Confined spaces checked for toxic and flammable gases, dust and oxygen levels.
❒	Department manager/supervisor notified work to commence	❒	All tools / equipment to be used checked and serviceable
❒	Detail special precautions		

AUTHORISATION		
Authorisation (Person authorising the work)	Signed:	Print Name:
Work Acceptance (Person undertaking the work)	I have been briefed & understand the scope of the work to be performed, am aware of hazards present, the precautions necessary & agree to abide by these precautions.	
	Signed: Date:	Print Name: Time:
Post Work Check (Person responsible for final checks)	Area checked and all penetrations sealed with no internal foam core exposed. Waste material has been removed and disposed securely outside building.	

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