Risk Solutions Guidance

Fire Safety Guidelines Where Composite Panels Are Installed.

Overview

Almost all composite panels have combustible foam insulation, some 'Approved' as fire retardant. Where composite panels are installed they need to be regularly inspected and maintained to ensure they remain in good and safe condition. You should identify and record the type of composite panels installed on your buildings and treat them as combustible in your site safety management and fire risk assessment. The term 'sandwich panels' is also used but these include built-up panels often with non-combustible insulation such as mineral wool. Verifying the type of insulation your composite panels contain is an important first step to safe panel management.

Composite Panels

The term 'composite panel' generally refers to a building wall or roof cladding element formed of two outer metal skins with some form of expanded plastic insulation material in between. In the vast majority of cases the insulation material adheres to the metal panels with no additional securing. This means the metal can delaminate from the foam insulation quite easily in a fire unless properly secured.

There are several types of insulation material in common use including polystyrene, polyurethane, polyethylene and polyisocyanurate and a brief summary of these is included in this guide.

Composite panels can be used in several applications: to form the external structural shell of the building; to form enclosures within a building; to subdivide a building; or as external rain screen / weather protection cladding. Each of these poses different challenges from a fire safety point of view. Additionally there are many types and brands of composite panels available and these vary by type of insulation and thickness as well as the exterior metal profile, finish and thickness.

It is not always obvious that composite panels are present. In some cases, particularly with rain screening, the insulation material can be relatively thin (a matter of a few millimetres) and is present more for structural rigidity than thermal properties. Even this can create a significant fire hazard especially when combined with other insulation materials that may not be inherently hazardous.

Where combustible composite panels are present it is essential that they are properly managed to help limit the exposure they create and their potential to cause large scale loss. The following section gives some guidance on this.

Composite Panel Management

Where composite panels are installed either internally or as part of the building structure and:

are not categorically identified as non-combustible (under large scale testing conditions)

or are not 'Approved' (see last section of this guide for an explanation of the term Approved):

the following precautions / controls should be in place:

- Ensure there is a policy to require use of Approved materials when panels are replaced or repaired. A long term programme of Un-Approved panel replacement should be considered.
- Remove the arson risk – combustible materials should not be stored within 10m of the building. Note this should be the general rule for any building, with exceptions given on a case by case basis.
- Formally inspect the condition of panels for signs of damage at least monthly.
- Actively encourage all staff to report panel damage as soon as it happens or is seen. Put in place an easily accessible reporting system to do this.
- Any damage / exposed material should be promptly repaired.
- No hot work to be done on composite panels e.g. cutting, grinding. The proximity of composite panels should be a consideration for any hot work carried out within 10m.
- Control cold work extremely closely e.g. rotary saw cutting, drilling. Any work on panels should be controlled using a permit to work system.
- Do not mount electrical equipment directly on panels. If this is necessary, fix a non-combustible panel to the wall first that extends at least 600mm around the extremities of the electrical equipment. The exception to this is where the electrical equipment enclosure already has a fire rating.
- Ensure any electrical cable penetrations are sheathed, collared and sealed to prevent exposure of the panel insulation and also to eliminate the risk of contact with sharp edges of the panel.

General Ignition Source Control Guidance and Good Practice

- Maintain good housekeeping practices including periodic, formal and documented 'physical condition' inspections. Any findings from inspections should be prioritised for completion and followed up to ensure they have addressed the issues found. See Fire Safety and Housekeeping and Fire Safety Self Inspection Checksheet for guidance.
- Ensure all electrical installations are designed, installed and periodically inspected and tested in accordance with BS 7671. Where deemed appropriate, thermographic testing should also be undertaken. See Periodic Inspection and Testing of Electrical Equipment for guidance.
- Reinforce smoking regulations and ensure this only takes place in designated safe areas with appropriate disposal methods.
- Ensure contractor control procedures are properly implemented. Audit these to ensure their effectiveness.
- Formal procedures for the control of any hot work or spark producing activity should be in place. This should apply to own staff as well as contractors. Audit the system to ensure it is being properly used and also that it is effective. See Control of Hot Work and Hot Work Permit for guidance.
- Ensure fire emergency evacuation and response plans and procedures are in place, up to date and periodically tested, including liaison with the Fire & Rescue Services as required. These plans should be realistic in their expectations of people's capability. See Emergency Response Procedures.
- Ensure that any emergency equipment is routinely inspected and maintained in accordance with the relevant codes and standards. This includes:
  1. Fire detection and alarm systems
  2. Emergency lighting and escape signage
  3. Dry and wet risers
  4. Sprinklers and other fire extinguishing and suppression systems

Fire Risk Assessment

- Ensure a robust fire risk assessment has been carried out and formally documented. The fire risk assessment should be a real time assessment reflecting the actual conditions of the building whilst occupied as opposed to the 'as built' or 'as planned' conditions. It is a dynamic document that should be considered and reviewed when any changes to the building or its occupancy are undertaken as well as annually regardless of changes.
- Request that any updated fire risk assessment takes account of the construction materials of the external envelope of the building as well as internal walls, ceilings and linings. Ask that the assessor accurately identifies and reports the construction materials and the impact they may have on the risk to life and potential for escape.
- Any findings or improvements resulting from the fire risk assessment should be implemented and documented as completed.
- Choose a registered fire risk assessor to carry this out. See 'A Guide to Choosing a Competent Fire Risk Assessor' published by the Fire Risk Assessment Competency Council available at http://www.london-fire.gov.uk/Documents/guidance-choosing-a-competent-fire-risk-assessor.pdf

Additional Guidance for High Rise Buildings

Compartmentation

- Ensure 'fire compartment' integrity is maintained. This includes;
  1. Make sure that occupants do not install anything penetrating walls without appropriate permission and, where penetrations to the fire compartment are present, examine fire stopping routinely
  2. Inspect and maintain fire doors periodically (at least once every six months) in accordance with BS 8214
  3. Front doors of flats should not be altered without permission from the managing agent / property owner
  4. Periodically inspect fire dampers where they are provided in ductwork or refuse chutes
  5. Ensure that cavity barriers in ceilings and other voids are inspected and maintained
  6. Where cavity barriers are installed within external cladding these should be periodically inspected for integrity and repaired if breaches are observed.

Other Ignition Sources

- Prohibit the use of barbecues and open flame heaters on balconies
- No permanently installed electrical equipment should be permitted on balconies.

Fire Performance

There are several criteria for selecting a suitable panel for a specific application. The main consideration for property risk should be fire performance, but factors such as thermal insulation capability, structural rigidity, exterior profile and appearance etc. are often treated with greater importance.

The contribution of certain types of composite panels to major losses is well documented and is not a recent phenomenon. The food industry has suffered numerous high profile fires over the last 40 years where combustible composite panels were identified as the main contributing factor. More recently, the use of composite panels for external cladding on high rise buildings has resulted in significant losses.

Factors that affect the fire performance of composite panels include: how they are secured and fitted together; the installation 'system'; interaction with other building materials; and the type of insulation material itself. It is reasonable to assume that any composite foam panel insulation is combustible, i.e. it will burn if sufficient heat is applied to it. What varies significantly with different insulation materials is:

- How rapidly it burns and the rate of heat release i.e. how fast and how hot it burns
- Whether it will support combustion i.e. it carries on burning when other fire sources are taken away
- The volume and type of products of combustion.

Given the wide range of panels, insulation materials and configurations available, it is difficult to be specific about the fire performance of each. The burning characteristics of different insulation types varies greatly. See the side-bar for an explanation of the main types of composite panels.

As a general guide, the fire performance and burning characteristics of the main materials are:

EPS and PUR insulation can behave like normal plastic material, burning in place and also forming flaming droplets. In nearly all cases when these panels are exposed to a significant fire, the adhesion of the exterior metal face fails which reveals the insulation material and adds further fuel to the fire. These types of material will also generally sustain fire when other heat / flame sources are removed.

In most cases where an EPS or PUR building becomes involved in a fire, a total loss of the building is highly likely.

PIR insulation has a better fire performance than EPS or PUR. It will burn when exposed to heat / flame but in most cases the surface forms an external char and does not form burning droplets. It will continue to burn where fresh material becomes exposed, possibly as panels delaminate, although in most cases once the heat / flame source is taken away the material will extinguish and does not sustain self-burning.

Smoke Emissivity

With the majority of plastic based insulation materials, when they burn they emit copious amounts of toxic and corrosive smoke and gases. Even a 'controlled' fire involving composite panels can result in extensive contamination and tainting of the surrounding area leading to significant down time and clean-up costs. Following a fire in smoke sensitive environments, it is often necessary to replace roof, wall and ceiling panels unaffected by fire due to smoke contamination.

What are the common types of composite panel?

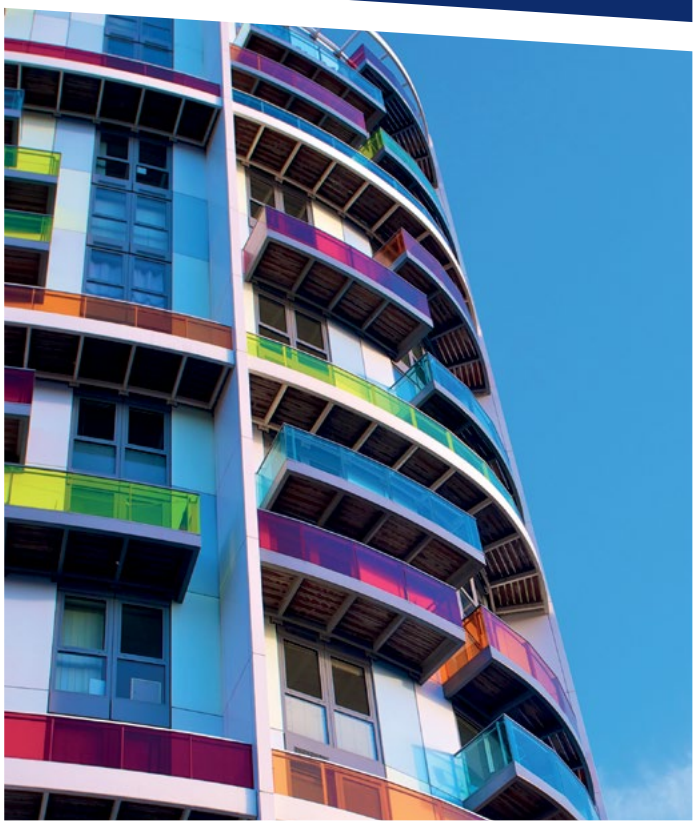
Polystyrene (EPS) insulated panels should always be treated as combustible and 'Non-Approved'. The insulation material is easily identifiable by its distinctive white foam balls compressed into solid blocks. It looks and feels similar to commonly used packaging material but more densely compressed. EPS panels are relatively cheap to buy and install, 30%-50% that of PIR.

Polyurethane (PUR) insulated panels of an older vintage pre-2003 should be treated as combustible and Non-Approved. The fire resistance capabilities of this 'standard' PUR is typically limited to 5-10 minutes. More recently installed panels reported as PUR might be 'enhanced fire resistant PUR', a term often used in Europe (but not UK). Always request explicit evidence of LPS 1181 Approval or FM 4880 Approval or a verifiable equivalent standard. Note that the Euro-Classification (usually Class B for sandwich panels) is not sufficient evidence. PUR is often orange or dark yellow in colour, is crunchy when pressed and becomes powdery if rubbed between the fingers.

Polyisocyanurate (PIR) is a form of polyurethane with significantly increased levels of fire retardant added. Many PIR panels will be LPS 1181 Approved and/or FM 4880 Approved, but explicit evidence should be requested. PIR is usually a paler yellow in colour than PUR, crunchy when pressed and slightly gritty when rubbed between the fingers.

Modified Phenolic (M-Phen) is relatively rare to find but has superior fire resistance and smoke release rating compared to other foam insulation materials. It is LPS 1181 Approved and FM 4880 Approved and is treated as effectively non-combustible, but it can cost several times as much as PIR to buy and install.

Mineral Wool is treated as non-combustible. This type of insulation includes stone wool and glass wool. Mineral wool does not need to be tested and Approved to LPS 1181, although some manufacturers do have this approval anyway. Mineral wool panels are most often built up in-situ when the building is constructed so the insulation is not adhered to the metal exterior panels. These panels are more often referred to as a 'sandwich panel' rather than a composite panel. Mineral wool is fibrous to the touch so is often not desirable in food or clean-room environments.



Approval

The term 'Approved' is frequently used when referring to composite panels but this can be both confusing and misleading. There are many Approvals that composite panels can achieve and fire performance is only one of these. The various standards, tests or approval authorities are not described here but it is important that testing undertaken to determine fire performance reflects the 'as built' situation the panels will face and the potential fire conditions they may be exposed to.

Small scale, surface flame spread tests or 'ignitability tests' do not reflect actual performance in real world fire conditions. This has been consistently proven from the evidence of many real fire situations. Examples of standards regularly cited that should be treated with extreme caution are:

- Class 0, 1, 2 or 3 to BS476 standards
- Euro Classifications B to F and the subsequent sub-classifications for smoke emissivity and burning droplet release.

Recent events have also reinforced the need to consider the cladding system used on a building and how the various components are arranged and interact.

In general for panels to be considered as Approved from a fire performance point of view, they should meet or exceed LPS 1181 or FM 4880 standards and carry the appropriate certification.

These standards not only test the actual reaction to fire but are specific about the method and type of fastening, orientation of the panel, maximum permissible height of use and impose requirements on securement at panel joints to maintain fire integrity.

Where the term Approved is used, it refers to panels meeting these standards.

As a general guide, it is mostly PIR insulated panels that carry the LPS or FM Approvals. EPS or PUR panels should be considered combustible regardless of any fire retardancy modifications or fire performance claims by the manufacturers.

Un-Approved PIR panels are a grey area. If these are relatively new (since c.2005) it is likely that the fire performance of the insulation material will not be much different to Approved PIR. However, they may not meet the additional fixing, jointing or orientation requirements and therefore may react differently in a large scale event. Manufacturers often sell almost identical PIR panels with and without LPS 1181 or FM 4880 Approvals, the only difference being interlocking panel edges and fixing methods for the Approved panels.

Undoubtedly some materials perform better in a fire than others. Unless you have clear and unequivocal proof that the insulation material in your panels is non-combustible or meets LPS or FM Approval criteria subject to large scale fire testing, then you need to be taking a range of additional safety measures and precautions as described in this guide to adequately manage your composite panels. These actions do not change the combustible nature of the composite panels themselves but help to minimise the potential for loss should a fire occur.

QBE Insurance Group Plantation Place 30 Fenchurch Street London EC3M 3BD
t.+44 (0)20 7105 4000 f. +44 (0)20 7105 4019 QBEeurope.com

8159GC/CompositePanelFireSafetyGuide/AUGUST2017

Useful Contacts & Links

- Risk Management Services: Risk Solutions web page
- Enquiries: rs@uk.qbe.com