Composite panels with combustible components have contributed to some significant fire losses. In these cases, the combustible components have supported fire spread, and in some cases rapid fire spread.

Not all composite panels with combustible components present adverse fire behavior. Panels deemed to be Zurich Recognized Solutions are assessed similar to noncombustible panels as long as they are installed in accordance with the manufacturer’s instructions and maintained in good condition.

Introduction

Composite panels – also known as sandwich panels, insulated panels, or white wall panels - are widely used to clad the exterior of buildings or to separate spaces within buildings.

The ideal composite panel, from a property risk assessment perspective, is formed from noncombustible components such as metal facers over a mineral wool core. However, a number of factors drive the selection of panels which include combustible components.

When panels with combustible components have been specified, consider replacing with a noncombustible panel or a panel considered to be a Zurich Recognized Solution, and the guidance contained within this document.
This document does not address:

- Aluminum composite panels. Aluminum composite panels may include a channel between the panel and wall (referred to as a ventilated façade or rain screen).

- EIFS (External Insulating Finish Systems).

- Exposed foam.

- Plastic coated foam insulation systems.

- Foil faced insulation boards. These boards typically use the same types of plastic foam insulation as some composite panels, but are covered with only a very thin metal foil, rather than the more substantial metal facer of a composite panel, which will typically have a thickness greater than 0.39 mm (0.015 in).

- Structural Insulated Panels. These panels are similar to composite panels in that they contain plastic foam insulation sandwiched between two facers, but the facers of are typically oriented strand board.

While these types of combustible panels or systems are beyond the scope of this document, they may contribute to fire spread and require careful consideration. For further information, contact your Zurich account team.

Discussion

Composite panel benefits

Composite panels are energy efficient, cost effective, light weight, and architecturally pleasing. Together, these characteristics may make composite panels a highly desirable construction solution for building designers and owners.

Composite panel applications

Composite panels are used in a wide range of building applications including refrigerated storage. Composite panels are often used in the food and pharmaceutical industries for their added hygienic benefit of easy cleaning.

Composite panel construction

Composite panels addressed within the scope of this document are formed by placing a core material between two facer sheets.

Figure 2 - Example of composite panels with a low density foam plastic core (Photo source: Zurich)
Panel facers may include steel sheets, aluminum sheets, or glass fiber reinforced plastic sheets. Facers along with the core provide structural rigidity, a moisture barrier, and a cleanable surface.

Composite panel cores materials may include:

- Mineral wool
- Foamed plastics

Foamed plastics may include:

- Polyisocyanurate foam – PIR
- Polyurethane foam – PUR
- Expanded polystyrene – EPS
- Extruded polystyrene – XPS
- Phenolic foam
- Expanded polystyrene beads suspended in phenolic foam – Phenolic EPS aggregate

**Composite panel use outside**

As exterior cladding, composite panels will be exposed to wind loads. This introduces a need for adequate panel securement to the structure to resist wind and maintain weather-tight panel joints. This securement is also a fire protection benefit as tight panel joints make it more difficult for fire to involve combustible panel core material.

Where composite panels are used as building cladding, fires involving the exterior face may occur due to:

- Electrical faults (transformers located adjacent to building walls, signs mounted on building walls, outside mounted air conditioning units, or photovoltaic panels on building roofs)
- Vehicle fires
- Yard storage fires
- Fires involving neighboring buildings

Fires involving exterior panel surfaces may be located beyond the reach of indoor fixed fire detection and fixed fire protection systems. Automatic fire detection may be delayed, and automatic sprinkler operation may be ineffective.

**Composite panel use inside**

Interior composite panels may be subject to more penetrations and openings, exposing the combustible core and increasing the potential for a fire to involve combustible core materials.

Interior composite panels may be used to form enclosures within a building known as “box-in-box” construction. Box-in-box construction can introduce concealed spaces. These concealed spaces can become
“combustible concealed spaces” when formed by combustible composite panels. Historically, fires in “combustible concealed spaces” have presented serious challenges to the responding fire service. As interior compartments, composite panels may not be subject to wind loads and, as a result, may not be afforded the same degree of support and bracing to maintain tight panel joints. For internal walls it is not unusual for the panels to be simply butt jointed together, with fixing only at the floor and ceiling joints. Panel joints may be covered with simple strips, and floor and ceiling joints may be covered with lightweight “L” sections. Other panel joint systems include proprietary interlocking systems using hidden clips and attachments.

Figure 3 - Tongue and groove interlocking system (Photo source: Zurich)

Figure 4 - Hidden clip connection at building steel (Photo source: Zurich)

Composite panel ceilings can be mounted on rigid steel frames, fixed to the underside of concrete floors or suspended from the roof structure by chains or cables.

**Composite panels and fire – Noncombustible cores**

Composite panels with non-combustible cores (mineral wool, stone or glass wool, foamed glass) do not contribute significantly to the development of a fire. Some of these panels have been tested and listed with fire resistance ratings and can be used to form fire resisting / rated compartments within a building.

The combustible binders and adhesives used in constructing these panels may burn and char, but the volume involved is not considered sufficient to sustain or contribute to fire spread. The nature of the bonded construction and potential for de-lamination and deflection contributes to eventual collapse of the panel in a severe fire condition, though the panel will not contribute to the fire load or intensity of the fire. One issue can be the release of mineral fibers to contaminate the fire scene, leading to potential health concerns and possible increased cleanup costs.

The benefits of non-combustible panels are considered to outweigh the disadvantages from a property risk assessment perspective.
Composite panels and fire – Combustible cores

The use of combustible panel components – such as plastic cores or glass reinforced plastic face sheets – raise concern with panel performance when exposed to fire.

While metal facers provide a degree of flame barrier for combustible core materials, the facers are not thermal barriers.

Expanded and extruded polystyrene are thermoplastics. When exposed to fire these materials may melt and drip. Fires involving polystyrene foam core panels may spread through panels between the facers shielded from automatic sprinklers and manual fire hose streams.

Polyisocyanurate, polyurethane, and phenolic foams are thermosetting plastics. When exposed to fire they char rather than melt.

All combustible cored composite panels have the potential to contribute to the fire load during a building fire. In practice, this contribution ranges from a high degree for an expanded polystyrene core panel to a negligible degree for a listed polyisocyanurate core panel.

Composite panel facer and core material are often bonded together with an adhesive. Metal facers may also wrap around the panel edge to improve securement to the core. Panels may also be through-bolted to mechanically hold the sandwich together. Separation of panel facers and core material during a fire may be extremely detrimental where panels are formed of combustible core materials.

Composite panel facers may be intentionally or accidentally penetrated leaving core material exposed to ignition. Intentional wall penetrations include door openings or openings for the passage of utilities. Accidental penetrations include forklift impacts penetrating the facer. Composite panel penetrations will expose the core material unless it is covered with material equivalent to the facer.

Guidance

Panel selection

Where composite panels are planned for a new building, consider selecting composite panels that are noncombustible (both the core and the facers). An option is to consider a panel that is a Zurich Recognized Solution (see Appendix B).

Sprinklers and composite panels that are Zurich Recognized Solutions

Composite panels that are a Zurich Recognized Solution allow the need for – and design of – fire protection to be based upon the building occupancy. Where a Zurich Recognized Solution is used, it is not necessary to install sprinkler protection based solely upon the presence of the combustible panels.

Existing panel identification

Identify existing composite panels to allow appropriate application of this guidance.
Composite panel identification

Panel identification may be easier when documentation is available. Difficulties arise when documentation is no longer available.

Some core materials, when visible, may be easy to identify. For example, expanded polystyrene is normally white and crumbles into its constituent small beads when crushed. Also, mineral wool, stone wool, or fiber glass are apparent due to their fibrous appearance.

Some core materials, when visible, may not be easy to identify. Core materials formed by polyurethane, polyisocyanurate, or phenolic insulations may be visually indistinguishable as they may all appear as yellow cellular plastic foams. This is a concern as many listed panels use core materials of similar appearance. This can make it difficult to visually distinguish between a listed panel (a Zurich Recognized Solution) and a non-listed panel.

When documentation is missing, it may be possible to track down information through the original builder or architect. In one case, a Zurich customer identified their panels by circulating panel photographs to panel manufacturers.

Where information leaves doubt as to the identification of the panel, conservative assumptions should be applied. For example, if an unidentified panel has a yellow cellular plastic foam core, assume it is a non-listed combustible panel and not a Zurich Recognized Solution.

As panels are evaluated, be sure to identify each type and style of panel in use. It is not unusual for a location to use several different types of panels. Different panels may be used for ceilings and walls. Different panels may be used as a building is modified or expanded.

See Appendix A for additional guidance on the appearance of different panel types.

Fast-burning panels

Composite panels with an expanded polystyrene or extruded polystyrene core are considered fast-burning.

Solutions to control fire challenges of fast burning panels may include:

- Ideally, remove and replace with noncombustible panel or a panel considered to be a Zurich Recognized Solution. It is understood this option may involve a significant capital expense and a significant disruption to business. Consult with your Zurich account team to discuss the implementation of this option.

- Provide a thermal barrier to cover all surfaces of fast-burning composite panels. Secure the composite panel and thermal barrier system so the system will not separate or delaminate under fire conditions. Through-bolting may be needed. It is understood this may not be practical option in some occupancies such as those with hygiene and environmental requirements.
Fast-burning panels and automatic sprinklers

A fire involving fast-burning composite panels may spread ahead of operating sprinklers, or within the panels shielded by facers from sprinkler discharge. Consult with your Zurich account team if automatic sprinklers are to be used as a solution for fast-burning composite panels.

Fast-burning panels and thermal barriers

For a thermal barrier, consider gypsum board at least 12.7 mm (0.5 in.) thick. Other thermal barriers may be considered in consultation with Zurich. For outside applications, the thermal barrier should be suitable for exterior use.

Combustible panels

Consider providing one of the following to control combustible panel features

- Ideally, remove and replace with noncombustible or a panel considered to be a Zurich Recognized Solution. It is understood this option may involve a significant capital expense and a significant disruption to business. Consult with your Zurich account team to discuss the implementation of this option.

- Provide a thermal barrier to cover all surfaces of fast-burning composite panels. Secure the composite panel and thermal barrier system so the system will not separate or delaminate under fire conditions. Through-bolting may be needed. It is understood this may not be practical option in some occupancies such as those with hygiene and environmental requirements.

- Automatic sprinkler protection.

Combustible panels

Combustible composite panels are those panels that are not:

- Fast-burning
- Noncombustible
- Zurich Recognized Solutions

Core materials will include polyurethane, polyisocyanurate, or modified phenolic / phenolic EPS aggregate. Combustible composite panels include panels with non-metallic facers (e.g. glass fiber reinforced plastic).

Hazards and exposure to composite panels with combustible and/or fast burning components

For composite panels with combustible or fast burning components, consider the following controls.

- Provide controls to reduce arson exposures to composite panels including: perimeter fencing, outside perimeter lighting, and control of waste bins and yard storage near composite panel exterior walls.
Heated equipment flues and composite panels

Heated equipment may include heaters, boilers, oven, and furnaces. Heated equipment flues include chimneys, exhaust ducts, extraction ducts, or other hot trunking. Clearances to maintain temperatures at combustibles below 70°C (160°F) is based upon guidance from NFPA 86 Standard for Ovens and Furnaces and NFPA 211, Standard for Chimneys Fireplaces, Vents, and Solid Fuel Burning Appliances.

• Segregate processes possessing fire hazards from composite panels with combustible and/or fast burning components. This does not apply to composite panels that are considered Zurich Recognized Solutions.

Process hazards and composite panels

Processes with fire hazards include heated equipment (ovens, furnaces, and industrial deep fat frying) as well as flammable and combustible liquids operations (fluid heating systems, spraying, dipping, mixing, and blending). Segregate these and similar hazards with at least two hour fire rated enclosures to separate the fire hazards from combustible components of composite panels. Consult with Zurich where segregation is not possible. Alternative measures may be possible. Examples include routing fluid heating piping in visible, accessible locations where fluid leaks will be promptly detected by personnel and separating hazards at acceptable distances from composite panels.

• Segregate workshops and technical spaces from composite panels with combustible and/or fast burning components. This does not apply to composite panels that are considered Zurich Recognized Solutions.

Workshops and technical spaces and composite panels

Workshops include carpentry, welding, painting and similar activities with an increased fire exposure. Technical spaces include electrical rooms, emergency generator rooms, battery rooms, and similar utility spaces with an elevated fire exposure. Segregate these and similar spaces with two hour fire rated enclosures to separate the fire hazards from combustible components of composite panels.
Electrical equipment and composite panels
The presence of composite panels with combustible and/or fast burning components highlights the need for:

• Avoiding the installation of electrical system features directly onto the surfaces of such panel
• Specific attention is directed towards light fittings and fixtures that have been a source of combustible panel ignition
• Avoiding electrical conduits penetrating through such panels
• Providing maintenance on at least an annual basis including electrical inspections and thermal graphic imaging

Management of composite panels with any combustible components
For composite panels with combustible or fast burning components as well as composite panel that are Zurich Recognized Solutions, consider the following controls.

• Assign a person to be responsible for the management of composite panel as outlined in this section.

Management and composite panels
Many fire exposures related to composite panels can be mitigated through management. Management can help reduce the chance of a fire occurring and can help reduce the severity of any fire that may occur. Assigning oversight to a single person also helps to avoid gaps in the management process.

• Prepare a site plan to show the location and types of all composite panels, and keep it up to date as changes are made to the building. Make the plan available to responding fire service.

Site plans and composite panels
When preparing the site plan, include composite panels that are noncombustible as well as Zurich Recognized Solutions. Without this information the fire service may assume all composite panels are combustible or even fast-burning and refrain from entering the building to conduct firefighting for property protection.
Inspections and composite panels
The intent of inspections is to identify issues with the integrity of metal facers, panel joints, or thermal barriers. The objective is to identify and report gaps or breaches that could allow a fire to involve combustible panel cores material.

Maintenance and composite panels
The intent of composite panel maintenance is to repair gaps or breaches in facer, joint, or thermal barrier integrity reported as a result of inspections.

Hot work and composite panels
Avoid hot work on or near combustible and/or fast burning composite panels. This includes welding, cutting, grinding, or other work using open flames or spark producing tools. Where alternative work methods are not possible, apply Zurich hot work guidance which includes:

- Thorough consideration of cold work methods
- A hazard analysis to identify all necessary protection measures
- Use of a hot work permit system
- Use of temporary protection, such as welding blankets and welding screens, to separate the composite panels from sources of sparks or flame

Yard storage and composite panels
Keep combustible yard storage such as wood pallets, plastic crates, and baled paper separated from composite panel walls containing combustible and/or fast burning components. Where separation is by open space, maintain a separation of at least 10 m (33 ft.). Where the separation distance is less, provide a fire rated walls between the combustible storage and the composite panels. The height and width of the wall should interrupt the line-of-sight between the storage and wall.
Electrical transformers and composite panels

For the purpose of this document, combustible dielectric fluids include both traditional fluids such as mineral oil as well as less flammable dielectric fluids which are subject to ignition under electrical fault conditions.

Keep electrical transformers with combustible dielectric fluids separated from composite panel walls containing combustible and/or fast burning components. Where separation is by open space, maintain a separation of at least 15 m (50 ft.). Where the separation distance is less, provide a fire rated walls between the transformer and the composite panels. The height and width of the wall should interrupt the line-of-sight between the transformer and wall.

The increased distance as opposed to yard storage considers the potential for a transformer to eject burning dielectric fluid under pressure when the transformer tank vents.

Battery charging and composite panels

Keep battery charging separated from composite panel walls containing combustible and/or fast burning components. Where separation is by open space, maintain a separation of at least 2 m (6.6 ft.). Where the separation distance is less, provide a fire rated walls between the battery charging and the composite panels or an alternative solution acceptable to Zurich. The height and width of the wall should interrupt the line-of-sight between the battery charging and wall. Where the fire rated wall is against the composite panels with combustible components, extend at least 1 m (3.3 ft.) laterally and 2 m (6.6 ft.) vertically beyond battery chargers.

Penetrations and composite panels

Penetrations in composite panels may include a variety of features such as doors, windows, ductwork, electrical cable trays, electrical conduits, and pipes.

Penetrations should be avoided, but where they are necessary, finish the penetration with noncombustible materials. For example, cover exposed combustible core material with metal flashing. Close the remaining opening with noncombustible materials. Consider materials such as approved, certified, or listed firestopping materials rather than ordinary foam-in-place sealants.

Contact manufacturer for penetration solutions using noncombustible materials. Manufacturer’s guidance may include the type and thickness of the metal flashing, joint methods, overlap distances, and metal flashing attachment methods.

Where core material is visible at an existing penetration or inappropriate materials were used to finish a penetration, refinish the penetration in accordance with manufacturer’s guidelines.
• Inspect heat tracing for freezer door seals weekly.

**Electric door seal heat tracing and composite panels**

Electric heat tracing is subject to physical damage from forklift truck traffic entering and exiting freezers. Verify weekly that physical protection features are provided and functional. Also verify weekly that electrical heat tracing shows no signs of physical damage, corrosion, discoloration (damage from overheating), or other signs indicating a need for service or repair. Damage to heat tracing could produce sources of ignition that could lead to fire involving combustible components of composite panels.

**Conclusion**

Whenever possible, consider selecting a composite panel formed from noncombustible components. Where composite panels with combustible components are selected, consider a panel that is a Zurich Recognized Solution.

A panel that is considered a Zurich Recognized Solution, would need to be:

• Installed in accordance with their approval, certification, or listing

• Installed in accordance with manufacturer’s guidance

• Maintained in good condition (no exposed core material)

In cases where composite panel with combustible components are in use, consider applying the guidance contained in this document.
References


Appendix A – Definitions and abbreviations

**Built-up construction**

The materials used to fabricate composite panels can also be used in assemblies constructed on site. Because these systems are field fabricated the details of facing skins, construction and insulation medium can vary significantly. The guidance in this document does not apply to built-up wall and roof cladding systems.

**Composite (Sandwich) Panel**

Prefabricated construction panels with a bonded inner core of insulating material faced on both sides with skins.

**Delamination**

De-bonding of the composite panels faces from the inner core. The result is exposure of the inner core material. This can be caused by failure of the adhesive bonding the face panels to the core when exposed to heat from a fire. This can also be caused by an inadequate or failed mechanical fastening system used to secure the faces to the core.

**Expanded Polystyrene (EPS)**

Expanded polystyrene foams are a thermoplastic, low density core with very good insulation properties and moisture resistance. Expanded products are molded from beads and generally have a density less than 24 kg/m³ (1.5 lb/ft³).

EPS melts at around 200°C (392°F) and has a flashpoint around 300°C (572°F).

EPS initially shrinks away from a heat source. This gives it adequate performance in small scale fire tests but in the presence of a larger fire (such as a full scale fire test or an exposing fire) the foam rapidly melts to produce an intense combustible liquid fire that generates large volumes of oily smoke. The addition of fire retardants to EPS foam reduce the ease of ignition but do not appreciably impact the fire performance of the product once ignited.

EPS foam is normally white (although occasionally dyed) and the beads from which the foam is formed are obvious to the eye. The foam is easily deformed and has a soft, wax like surface texture.

** Extruded Polystyrene (XPS)**

These thermoplastic foams are similar to expanded polystyrene but with a higher density. Extruded polystyrene is formed by a foaming process and usually has a density greater than 24 kg/m³ (1.5 lb/ft³).

The fire performance of extruded polystyrene is similar to that of expanded polystyrene, although the higher density of the product gives a higher heat output per equivalent volume of panel.

Extruded polystyrene has a fairly uniform closed cell appearance, unlike the obvious beads which make up the structure of expanded polystyrene. It may be dyed a color such as blue.
**Glass Foam**

This is a unique (and expensive) core material, formed from gas blown glass. It is non-combustible and has excellent mechanical and insulation properties but is rarely encountered due to its higher cost compared with other panel types.

**Glass wool/ Rock wool/ Stone wool**

These core materials are non-combustible mineral fibers, although bound together will small amounts of combustible organic binders. The core has no (or little) structural integrity and the insulation and moisture resistance is not as effective as closed cell foams such as expanded polystyrene.

Mineral fiber cores resist temperatures to 1,000°C (1,832°F) and can be used in fire rated applications. The fibrous nature of this insulation usually makes it easy to identify.

**Listed**

A conditional approval issued by a recognized testing laboratory following full scale testing of the composite panel system. (See Appendix B for details).

**MMMF**

Man-made Mineral Fiber (glass, stone or rock wool)

**Modified Phenolic / Phenolic EPS aggregate**

Phenolic foams are another set of thermosetting cellular plastics. These foams pyrolize to produce an insulating char and produce a lower amount of smoke compared to other polymers.

Some cores are now being produced from expanded polystyrene beads suspended in phenolic resin. This composite material combines some of the attributes of both expanded polystyrene and phenolic products, but is understood to produce more smoke than straight phenolic foam.

Phenolic foam usually has a very similar cellular appearance to polyurethane and polyisocyanurate foams. Its color can vary, and is sometimes a brownish pink, but it can be difficult to distinguish from yellow polyurethane and polyisocyanurate foams. Phenolic/ expanded polystyrene cores are easily identified by the white expanded polystyrene beads suspended in the resin.

**Polyisocyanurate (PIR)**

Polyisocyanurate foams are a modified form of polyurethane cellular foam. They have similar mechanical performance to polyurethane foam.

The fire behavior of polyisocyanurate foams is similar to that of polyurethane, but with a lower rate of pyrolysis and a more rigid char structure that leads to reduced burning rates in fire testing.

Polyisocyanurate foams are very similar in appearance to polyurethane and cannot be confirmed merely by observation. They are typically light yellow (honey) in color and with a stiff cellular structure. The foam is quite rigid, but easily marked and has a rough, almost dusty surface on cut edges.

**Polyurethane (PUR)**

Polyurethane foams are thermosetting cellular plastics with a range of densities. Its insulation and moisture resistance properties are similar to polystyrene.
Polyurethane foams are combustible and will support flaming, but unlike polystyrene they do not melt. Instead, polyurethane foams will form a surface char that slows the burning rate.

Polyurethane foams will generate a dense acrid smoke. Polyurethane foams decompose at around 230°C (446°F), emit flammable vapors above 300°C (572°F) and ignite at around 310 – 370°C (590 – 698°F).

Polyurethane foams are typically light brown or yellow (honey) colored with a stiff cellular structure. The foam is quite rigid, but easily marked and has a rough, almost dusty surface on cut edges.

**Thermal Barrier**

A noncombustible (or slow burning) insulating barrier applied to the exposed face of a combustible composite panel to slow the ignition of the composite panel. Thermal barriers can include gypsum based boards, calcium silicate boards, cement, fibrous cement sheeting, or heavy plywood. The metal skins of composite panels are not thermal barriers.

**White wall panels**

Composite panels used as internal walls and ceilings in highly insulated buildings such as cold stores, or in occupancies such as food factories, usually contain more insulation and have a white colored facer, and are often referred to as “white wall” panels.
Appendix B – Zurich Recognized Solutions

Composite panels considered a Zurich Recognized Solutions are approved, certified, or listed by a Zurich Recognized Testing Laboratory based upon testing to an acceptable laboratory test protocol. In addition, these panels are installed and maintained in accordance with their approval, certification or listing as well as manufacturer’s guidelines.

**Acceptable laboratory test protocols**

There is no one, globally-acknowledged, “Acceptable laboratory test protocol” for evaluating composite panels. A range of regional or national test protocols are available for composite panel evaluation.

Avoid selecting composite panels based upon intermediate-scale fire test protocols. See Appendix C for further discussion regarding concerns raised with intermediate-scale fire tests.

Consider selecting composite panels based upon a full-scale test protocol. Select a test presenting a rigorous fire exposure to the composite panel under test. The test should challenge the integrity of the metal cladding, panel joints, and core material.

Full-scale fire tests may include both façade tests and room corner tests such as the most recent edition of the test protocols outlined below.

**Full-scale façade fire tests**

- **ANSI FM 4880** American National Standard for Evaluating; A) Insulated wall or wall & roof/ceiling assemblies; B) Plastic interior finish materials; C) Plastic exterior building panels; D) Wall/Ceiling coating systems; E) Interior or Exterior Finish Systems

- **BS 8414-1** Fire performance of external cladding systems - Part 1: Test method for non-loadbearing external cladding systems applied to the masonry face of the building

- **BS 8414-2** Fire performance of external cladding systems - Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

- **CAN/ULC S134** Standard Method of Fire Test of Exterior Wall Assemblies

- **DIN 4102-20** Brandverhalten von Baustoffen und Bauteilen - Besonderer Nachweis für das Brandverhalten von Außenwandbekleidungen, als Bestandteil der Zulassungsgrundsätze des Deutschen Instituts für Bautechnik (translation: Fire behavior of building materials and components - Specific proof of the fire behavior of exterior wall claddings, as part of the approval principles the German Institute for Building Technology)
• ISO 13785-2 Reaction to fire tests on facades – Part 2: Large scale test


• UBC 26-9 Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-scale, Multistory Test Apparatus
  Note: UBC 26-9 uses the words “intermediate-scale” in its name as it was a reduced version of a larger-scale test, UBC 26-4 Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-bearing Wall Panel Assemblies Using Foam Plastic Insulation.

• SP FIRE 105 External Wall Assemblies and Facade Claddings Reaction to Fire

Full-scale room corner fire tests

• EN 14390 Fire test. Large-scale room reference test for surface products

• ISO 9705 Reaction to fire tests. Full scale room tests for surface products.

• ISO13784-1 Reaction to fire test for sandwich panel building systems -- Part 1: Small room test

• ISO 13784-2 Reaction-to-fire tests for sandwich panel building systems -- Part 2: Test method for large rooms

• NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

• LPS 1181 Part 1 Series of Fire Growth Tests for LPCB Approval and Listing of Construction Product Systems Part One: Requirements and Tests for Built-up Cladding and Sandwich Panel Systems for Use as the External Envelope of Buildings

• LPS 1181 Part 2 Series of Fire Growth Tests for LPCB Approval and Listing of Construction Product Systems Part Two: Requirements and tests for sandwich panels and built-up systems for use as internal constructions in buildings

• UL 1040 Fire Test of Insulated Wall Construction

• UL 1715 Fire Test of Interior Finish Material

Zurich Recognized Testing Laboratories

A Zurich Recognized Testing Laboratory is a product certification body. They are evaluated by a third-party accreditation body for their ability to perform self-accreditation of their product testing.

Qualified third-party accreditation bodies that accredit product certification bodies include members of the International Accreditation Forum, Inc.

See → http://www.iaf.nu/articles/IAF_MEMBERS_SIGNATORIES/4

See the RiskTopic Zurich Recognized Solutions for further discussion of Zurich Recognized Testing Laboratories.
Appendix C – EU classification system for reaction to fire

Background

EN 13501-1 *Fire classification of construction products and building elements. Part 1 – Classification using test data from reaction to fire tests* provides a European classification system for building products based upon varying levels of “reaction-to-fire”. The system considers:

Fire growth rate – FIGRA

Fire growth rate is dependent upon a material’s tendency to release heat. Noncombustible materials rate A1. Materials with varying degrees of combustibility rate A2, B, C, D, E, or F with F representing the greatest fire growth rate.

Smoke growth rate – SMOGRA

Smoke growth rate is dependent upon material’s tendency to release smoke. Materials with varying degrees of smoke development rate s1, s2, or s3 with s3 representing the greatest smoke growth rate.

Flaming droplets or particles

Flaming droplets or particles is dependent upon material’s tendency to drip or otherwise release flaming particles. Materials with varying degrees of flaming drops or particles rate d0, d1, or d2 with d2 representing the greatest flaming drop or particle rate.

Building products manufactured or sold in Europe will typically be classified based upon this system.

Concern

The EN 13501-1 classification standard stipulates specific fire tests to be used in the classification process. For products classified as A2, B, C, and D, the tests are:

- **EN 13823** Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning Item

- **EN ISO 11925-2** Reaction to fire tests - Ignitability of products subject to direct impingement of flame, Part 2: Single-flame source test.

These are intermediate scale tests. For example, EN 13823 exposes the product under test to a 30 kW (444,000 Btu/hr.) burner flame.

Concern has been raised with the ability of the intermediate-scale EN 13823 and EN ISO 11925-2 tests to accurately classify composite panels. See references [8], [9], [10], and [11]. Concerns relate to the size of the heat source used as it may not create sufficient fire exposure to the product under test.

In light of the concern raised with intermediate-scale tests, when a composite panel is not classified as A1 or A2 consider using a full-scale fire test (such as those identified in Appendix B) to determine if a composite panel should be considered noncombustible or combustible for property risk assessment purposes.
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