

The Promat logo is displayed in white text on a blue rectangular background. The background image of the entire page is an aerial view of a large industrial steel structure under construction, with several workers in high-visibility vests and hard hats standing on the floor plates. Stacks of steel beams are visible on the left side.

Promat

by etex

VERSION 1

OCTOBER 2025

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We understand
the importance
of controlled
testing for
structural steel
fire protection.

Protecting structural steel

Fire board vs intumescent paint

Tested board systems: The only comprehensive passive fire protection system for structural steel compartmentation

The introduction of the Building Safety Act 2022 has seen the fire safety landscape evolve significantly with a requirement to design passive fire protection systems accurately at the earliest stages of a project.

A lack of detail, or an unsuitable application, could cause a project to be rejected at gateway 2, causing lengthy delays or, in a worst-case scenario, leave a building vulnerable to the rapid spread of fire if an inadequate solution is specified.

Getting passive fire protection correct at the first stage is paramount. When constructing a new building using structural steel it is imperative that the passive fire protection system provides both structural and fire protection for the whole building.

To achieve a comprehensive level of compliant passive fire protection, the correct system for the application must be specified and be backed by third-party certification or classification.

Where compartmentation is being utilised to prevent the spread of fire from one area to another it is essential that products tested for that particular application are used to ensure that the entire 'compartment' will resist the spread of fire for the required period of time. This requires adequate consideration within the design of wall and ceiling constructions, penetrations, doors and openings, as well as interfaces between all these elements.

It is testing that sets systems apart – and shows very clearly the best choice for a particular project and application. To provide a system that is fully tested to protect structural steel, Promat has tested its passive fire protection board systems along compartment lines in a structural steel application to demonstrate that the system provides compartmentation for up to 240 minutes. Very few products currently combine this level of compartmentation testing, backed by third-party

certification, while also protecting the structural steel. This is arguably the most compliant method of passive fire protection for structural steel where compartmentation is required.

With the Building Safety Act placing a greater focus on the need for accurately specified passive fire protection in buildings above 18 metres tall, inherent within this is the need for compartmentation to be designed at the earliest stage to limit the spread of fire and protect escape routes.

This paper explores the difference between two commonly specified systems of passive fire protection when protecting structural steel: intumescent coatings and fire protective boards. Although intumescent paints are a commonly used fire protection method, they are not suitable for applications that require compartmentation. Conversely, Promat's fire protective boarding systems have secured successful third-party testing when used to protect structural steel on compartment lines – the only tested product available for use in this application.

Guidance in the ASFP yellow book advises that the same system should be used on an element to avoid interfacing. Where compartmentation along structural steel joints is required on an element, the use of passive fire protection board that provides compartmentation, such as Promat's structural steel protection systems, would be a best practice solution.

As the Building Safety Act places direct accountability on the principal designer appointed to the project to demonstrate fire safety compliance at every stage of a project, from the planning stages before permission is granted, before construction begins and before it can be occupied it is the manufacturers' duty to ensure product testing supports effective specification. This is what Promat aims to do through its leading library of tested passive fire protection solutions for structural steel.



Board versus paint: What is the best choice for compliant structural steel passive fire protection?

Structural steel requires passive fire protection to maintain stability during a fire as unprotected steel typically loses 40% of its strength at 550°C, and as steel temperatures rise, the loss of strength is rapid and significant. Under the Building Regulations (Approved Document B) structural steel must resist fire for 30, 60, 90 or 120 minutes, depending on the building's height and use class.

For example, an office building that falls into the 18-30m category would mean its structural load-bearing elements must typically meet the minimum fire resistance requirements of 90 minutes, according to Approved Document B.

Both passive fire protection board and intumescent paint can provide fire resistance for a set period of time when installed correctly, in line with manufacturers' instructions.

A crucial difference is that intumescent coatings cannot be used in applications where steel forms part of a compartment boundary. In these cases, tested boarding systems are the only fully compliant solution.

This includes instances where structural steel elements, such as beams, columns or framing are embedded within, directly support, or penetrate a fire-rated wall, floor or ceiling that is designed to prevent the spread of fire, smoke and heat between compartments.

If the compartmentation is compromised on the structural steel boundaries, fire will escape and the compartment will fail to contain a fire should one break out.

UNDERSTANDING THE TWO APPROACHES

Fire protective boards and intumescent paints are the two most widely used methods of passive fire protection for structural steel in the UK and Ireland.

FIRE PROTECTIVE BOARDS

These are factory-manufactured, non-combustible boards, typically ranging in thickness from 15mm single layered to 35mm double layered, that encase steel to limit heat transfer. Once installed, they provide immediate protection and do not require post-installation measurements. While many passive fire protection solutions currently on the market in the UK have been tested to BS 476 to ensure they perform consistently and are suitable for high-risk applications where certainty is needed, from 2029 all systems will be required to meet the more stringent EN 13381-4 standard - Promat already tests its systems to this standard.

INTUMESCENT COATINGS

These are reactive coatings that are applied in liquid form, typically being sprayed, brushed or rolled onto the steel surface in multiple layers. They require the steel to be clean and rust-free, and their performance is dependent on precise application, suitable environmental conditions and post-application maintenance.

This means strict quality control during application to ensure the correct layering and uniformity of thickness. As such, they are more prone to installation errors, particularly when required to be applied on site, and require ongoing inspections. Ultimately, intumescent coatings cannot be used for compartmentation because they lack the required insulation performance (I rating).

In comparison, fire boards are manufactured to precise thicknesses to achieve 30, 60, 90 or 120 minutes of fire resistance, whereas intumescent coatings require multiple layers and must be measured after application to confirm compliance.



Considerations when choosing fire protection.

1. COMPARTMENTATION

Compartmentation is a fundamental principle of fire safety and is designed to limit the spread of fire and smoke within a given area, allowing occupants more time to escape safely and for emergency services to respond.

Structural steel that forms part of a compartment boundary must be protected with materials that meet all three fire resistance criteria specified in Approved Document B: this includes R (the load-bearing capacity that allows the steel to maintain structural strength during a fire), E (the integrity of the steel against the passage of flames and hot gases) and I (its ability to insulate and limit the temperature rise on the unexposed side).

Promat passive fire protection board systems are currently the only solution that have been successfully tested and verified to ensure compartmentation remains intact when used on compartment boundaries where structural steel is being used. Testing demonstrated that Promat's fire protective boards met all three requirements of Building Regulations Approved Document B and so, for any steel structure that requires compartmentation, boards are the only viable option due to the way in which intumescent paint is activated.

The key consideration here is that intumescent coatings only provide load-bearing protection, but fail the insulation requirement. The point at which the paint begins to char to protect the steel is higher than the temperature needed to provide compartmentation. This makes intumescent paint unsuitable for compartment boundaries as the time it takes for the paint to intumesce to insulate the steel will be less than the time it takes the steel to conduct the heat along compartment lines.

Further to this, it is difficult to interface painted steelwork with other systems along compartment lines while leaving enough space for the paint to expand when it reacts with fire. If gaps were left on compartment lines a fire would be able to pass through the space, and the passive fire protection solution would fail to provide compartmentation to stop the fire from spreading.

There are further considerations in leaving space around the steel on compartment lines to allow for intumescent paint to expand as this can have repercussions on acoustic performance and insulation as the space needs to be left entirely free.

In contrast, Promat's fire protective board systems have been tested for their ability to provide all three requirements of Building Regulations Approved Document B. For any steel structure that requires compartmentation, specifically tested board systems are the only viable option and provide a complete solution that does not leave any gaps.

Moreover, where compartmentation is required at an interface it has been defined as best practice within the ASFP yellow book that the same passive fire protection system should be used to avoid further, unnecessary interfacing between systems.

In the case of maintaining compartment lines on structural steel, Promat passive fire protection board systems should be used as this is currently the only tested solution to maintain compartmentation in this application.

2. APPLICATION CHALLENGES AND DESIGN CONSTRAINTS

Intumescent coatings typically require 50 times the applied paint thickness of expansion clearance to work properly. This can reduce the maximum usable floor space and make it more difficult to integrate services like HVAC, cabling and ducting. In some cases, it can also compromise structural interfaces like partition walls. The requirement for expansion space can also create issues where work is carried out on a property without the understanding of the need to leave space for the intumescent. Further issues can come from fixings being applied to steel that has been coated with intumescent paint as this will compromise performance as the seal is broken.

Fire protective boards do not require additional clearance, making them ideal for applications where space is limited or has complex junctions.

The environmental and site conditions on the day of application are also crucial to consider. Intumescent coatings are sensitive to environmental conditions during application and their curing process. They typically need to be installed in temperatures between 5°C and 35°C. The substrate must be clean and dry and rust-free.

The maximum relative humidity must be under 80% and the added curing time needs to be factored into the project timelines. The first coat is typically touch dry within three hours, subsequent coats may take up to 8 hours to dry, and full curing can take up to 72 hours for water-based intumescent coatings.

In contrast, fire protective boards can be installed in any weather condition, they are not impacted by humidity and do not require a curing period, allowing construction to proceed without delays.

3. TESTING AND PERFORMANCE

Both fire protective boards and intumescent coatings are tested under BS EN 13381. However, their performance, reliability and durability can be significantly different.

Testing and performance of fire boards

Testing fire boards involves putting steel sections through controlled fire conditions and measuring temperature rise over time. Because they have a fixed thickness, fire boards offer a predictable level of protection that can be verified. This can reliably be used to prevent steel reaching its limiting temperature, where critical failure will occur (typically 550°C to 580°C).

Part of the global Etex Group, Promat is a worldwide producer of fire protective boards made from calcium silicate and hybrid gypsum technologies. The company offers key ranges of fire protection boards specifically for the protection of structural steel, this includes PROMATECT®-XS, PROMATECT® 250 and VERMICULUX®-S. They are tested to EN 13381-4 with verified fire resistance ratings ranging from 30-240 minutes.

All Promat boards for steelwork protection are rated A1 non-combustible. PROMATECT®-XS and VERMICULUX®-S can also be installed before the building has been made weather tight; and have an impact resistant finish that can be easily decorated.

Testing and performance of intumescent coatings

Although intumescent paint can be tested to the more onerous EN 13381-8:2013 standard, its performance can vary depending on the way it is applied - and many paints are still tested to BS 476. It needs to be sprayed precisely to achieve the correct dry film thickness (DFT), which can vary based on the size and shape of the steel and the level of fire resistance required. If it is applied unevenly, or in layers that are too thin or too thick, this can result in inadequate fire protection.

This uniformity is an important factor. Unlike fire boards, intumescent coatings only activate when they're exposed to fire, typically between 150°C and 250°C. Here, they expand to 20-50 times their original thickness, forming a char layer that insulates the steel. The effectiveness of the coating depends on it adhering well to the surface and expanding uniformly. However, factors including humidity, curing time and application errors can all compromise its performance.

4. SAFETY, MAINTENANCE AND LONGEVITY

Once installed, fire protective boards require little to no maintenance and can last up to 30 plus years. Their fixed, solid-state composition continues to provide protection without the need to be reapplied.

In contrast, intumescent coatings can degrade over time. They need to be regularly inspected and, in some cases may need to be reapplied. They also come with added long-term costs, for example, if a coating becomes damaged the entire layer may need to be removed and reapplied. At the least, the paint and primer in the affected area would need to be removed and the steel cleaned to allow for repainting.

The impact of fixtures and upgrades that affect the passive fire protection used to protect the steel structure should also be considered. Passive fire protection board systems are a solid design where any penetrations, cracks or tears in the board are easily visible - and compartmentation/ full protection can be restored through the replacement of individual boards.

Where a layer of protective intumescent paint has been compromised through damage that has caused a gap or by the addition of fittings to the surface, the coverage can be affected - and in turn the performance. To correct damage to intumescent paint, the surface may need to be stripped back completely and the paint reapplied from scratch to ensure an even, and fully comprehensive coating.

Considerations when choosing fire protection. (Continued)

5. A FUTURE-PROOF SOLUTION

As discussed at the outset, the introduction of the Building Safety Act is significantly changing the accountability placed on principal designers and the resulting fire-protection choices they make.

From March 2025, BS 476 will no longer be accepted for reaction-to-fire classifications and roofing classifications in Approved Document B. By September 2029, all remaining references to BS 476, including those related to fire resistance, will be fully withdrawn from Approved Document B.

This change has major implications for intumescent coatings, as many were originally tested only to BS 476 and may no longer meet the regulatory requirements. Promat's passive fire protection board systems for structural steel are already tested to the European EN 13381-4 standard, which means they will continue to be compliant long after these changes come into force.

Tested board systems: A safer choice

Architects, engineers and specifiers need certainty when choosing structural fire protection solutions. They need something that is reliable, verifiable and offers compliance now and in the future.

For the protection of structural steel, Promat's fire board systems that have been tested along compartment lines offer a clear advantage over conventional methods, including intumescent coatings, while in addition they offer predictable fire resistance and performance that is not affected by environmental conditions or the variables during application.

Compartmentation is today one of the most important factors for fire safety. Unlike intumescent coatings, Promat's extensively tested passive fire protection boards meet all three areas of the fire resistance criteria, including load bearing capacity, integrity and insulation. This makes them the only fully tested compliant choice for compartment boundaries in structural steel projects.

Passive fire protection board systems are also easier to install and maintain, and do not need extra clearance for expansion, along with no curing time and no specialist tools to verify thickness. They can be easily inspected visually on site and provide immediate fire-resistance once installed, with an expected lifespan of over 30 years.

To enquire about Promat's range of fire protective boards for structural steel please visit the Promat website at www.promat.com/en-gb/construction/structural-protection or call 0800 373 636 or email sales.construction@promat.co.uk





GB Orderline

For placing orders, delivery enquiries and local stockists etc.

0800 373 636 (Select option 1)

sales.construction@promat.co.uk

Customer Support

For any problems with invoices or deliveries

0800 373 636 (Select option 2)

customersupport@promat.co.uk

Technical Services

For technical support and advice

0800 145 6033 (Select option 2)

technical@promat.co.uk

Etex Building Performance Limited

Marsh Lane, Easton-in-Gordano,
Bristol, BS20 0NE

01275 377 773

promat.com

0861-PRO V1/10/2025

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