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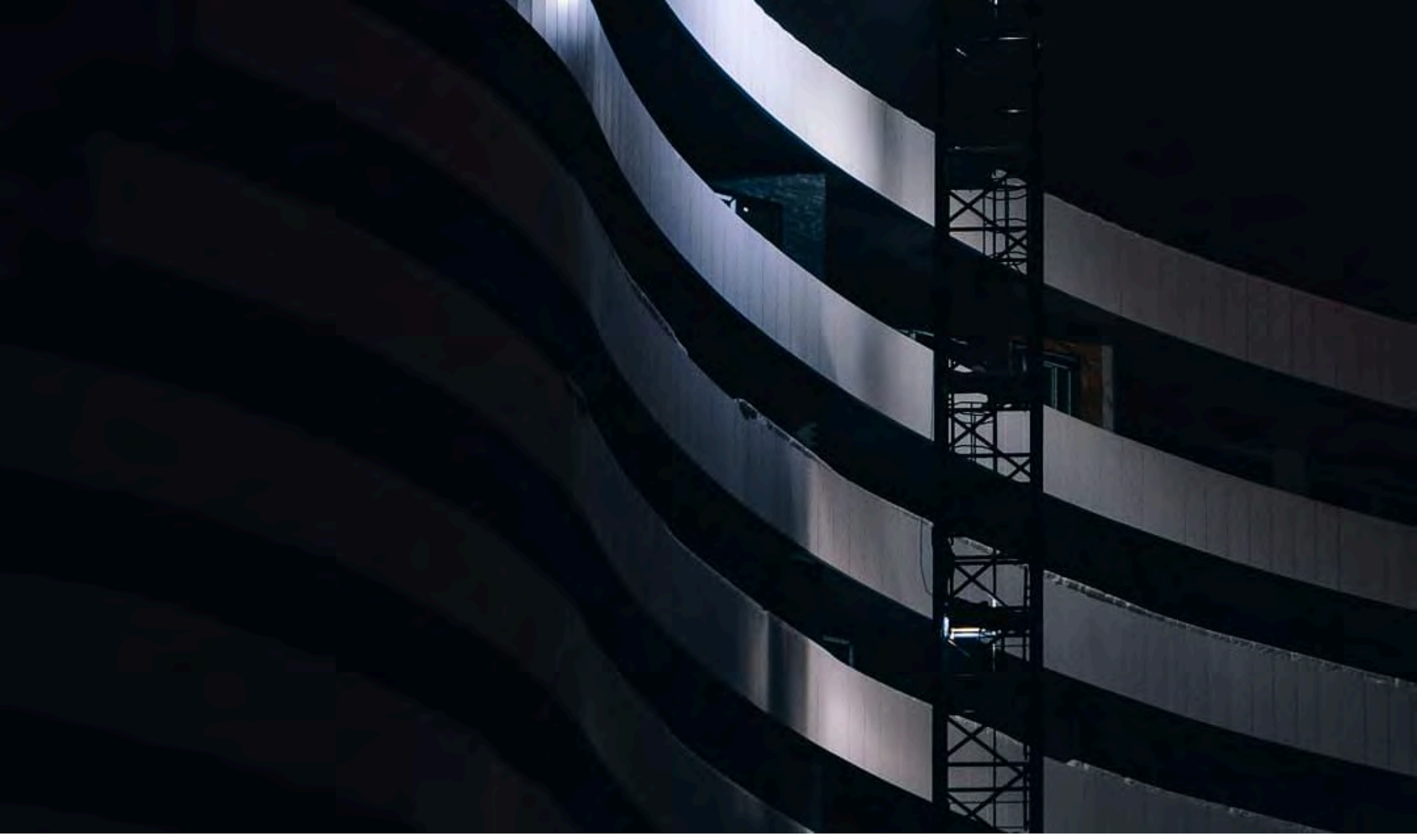
# Cut the complexity of passive fire protection

A guide to make tough decisions easier

TOUGH. Made Easy



# Introduction

**As cities expand, new commercial and industrial buildings pop up everywhere and with them comes the need for reliable fire protection. Steel fabricators and coating applicators like you play an essential role, helping shape structures that aren't just strong, but also safe and built to last.**

Still, passive fire protection coatings (PFP) aren't usually top of mind when architects sketch out a new build. They start with form, flow, and aesthetics. It's later, during detailed design and engineering, that safety systems like PFP come into play. That's when engineers focus on performance, compliance, and constructability. And that's where your expertise matters.

Your work isn't just about metal, it's about creating a system of strength, protection, and longevity. The coating isn't just a finish; it's a technical asset that impacts safety, durability, and long-term maintenance for decades.

This guide helps you make your case for the right PFP system, using arguments that connect with architects, engineers and builders and help drive better project outcomes.

# What's changing and why it matters

Fire protection isn't just a compliance checkbox anymore; architects and engineers are navigating evolving regulations, rising safety expectations, and tighter sustainability goals.

The world around us is shifting rapidly, and the needs for fire protection are changing in response.

## Here's what you're up against:

**MORE HIGH-RISE AND CRITICAL INFRASTRUCTURE**

including hospitals, data centres, and commercial buildings, is expected to grow, increasing the need for robust fire protection.

**COMPRESSED SCHEDULES**

Construction projects are becoming increasingly compressed, with fabrication timelines tighter than ever. There's no room for inefficiency.

**LEANER DESIGNS**

The cost of steel is rising, and the shift towards lighter profiles, cellular beams, and leaner designs in modern construction present tougher PFP challenges.

**SUSTAINABILITY PRESSURE**

ESG reporting, VOC limits, and $CO_2$ documentation have become an unavoidable and time-consuming part of the delivery now.

**REGULATIONS ARE STRICTER**

Building codes are ever evolving and the bar for compliance keeps rising, which puts PFP applicators under pressure to meet higher standards.

**COSTS ARE CLIMBING**

PFP is no longer a small line item in construction and can significantly increase the overall budget of steel fabrication. Safety is non-negotiable, but with the right strategy, costs can be managed.

**In short: the stakes are higher, and the margin for error is smaller.**

# **Do you know** the dynamics of fire and passive fire protection?

**There are two main types of fire: hydrocarbon fires and cellulosic fires. Hydrocarbon fires heat up to extreme temperatures more rapidly, fuelled by substances like oil and gas. For this guide, we focus on cellulosic fire for infrastructure.**

Cellulosic fires occur in infrastructure environments, such as offices, schools, hospitals, warehouses, etc. They are fuelled by solid materials like paper, wood, or textiles and can reach temperatures around 500°C within 5 minutes.

Steel weakens progressively in fire. Around 500°C it retains roughly 80% of its room-temperature yield strength.” Or “Steel weakens progressively in fire. Around 600°C it retains roughly 50% of its room-temperature yield strength.

Once a steel member reaches its critical core temperature, CCT (also known as limiting temperature), then it will lose its load-bearing capacity and fail.

Intumescent coatings begin to react at 200–250°C, expanding to form an insulating char layer on the steel that protects it for 30 to 120 minutes — and in some systems, even up to 4 hours.

The PFP coating helps ensure that steelwork maintains its structural stability and fire resistance, typically for up to two hours, and in some cases even longer, depending on the coating type and the applied Dry Film Thickness (DFTs).

# The dilemmas you face

Specifying PFP is a complex task that must be performed with every new project. Doing it right with all the challenges involved, how do you balance performance, efficiency, and cost without compromising any of them?

## Here are the core dilemmas we hear from steel fabricators and PFP applicators:

### APPLICATION COMPLEXITY

Intumescent coatings can be applied off-site or on-site, but off-site work offers the highest level of control with consistent shop conditions, faster throughput, and fewer weather risks. Still, it requires careful handling during transport to avoid costly damage and touch-ups. On-site application avoids transport damage and allows flexibility for large or complex structures. But it's more exposed to weather, humidity, and curing challenges. Deciding between the two usually comes down to balancing control and efficiency versus flexibility and cost.

### COST JUSTIFICATION

Total cost matters. If a PFP system appears more expensive at first glance, applicators and fabricators must be ready with solid, evidence-based arguments. The actual value lies not only in the purchase price but in the total cost of ownership, including application efficiency, operational costs, and the full coating system's durability. The best choice balances performance, compliance, and long-term value – not just initial spend.

### KNOWLEDGE GAPS

Not everyone in the value chain is up to date with the latest coating technologies, or fire- and building regulations, which leads to poor decisions. They need guidance to define a PFP strategy that is both effective and efficient.

### BLIND SPOTS IN SCHEDULING

Poor planning can result in the coated steel being left in the yard for weeks or months before installation. That kind of exposure to uncontrolled environments risks damaging PFP performance. If coating process times aren't included in the schedule, it creates bottlenecks, slows throughput, and reduces overall productivity.

This guide helps you navigate those dilemmas with confidence.

# What you know and what you need to argue

You know steel. You know what works in the paint shop. You care about drying time and asset handling, and you want to reduce waste and avoid rework.

But you also need to be able to argue your case to engineers, architects, and cost managers.

Here’s what you need to be ready to say:


These arguments reflect what you know, what you experience daily, and what the rest of the construction team needs to hear.

Speaking about performance, sustainability, compliance, and value shifts the conversation from cost to quality.

# The smarter choice starts with the right questions

You've made your case. You've shown that you understand the product, the process, and the priorities. Before accepting the specifications from the construction engineers, it may be worth asking yourself a few questions.

Such questions are not just about your time and margins, but also the integrity of the entire build and the project's long-term success.

## To make the right choice, ask:

**What's the PFP's life cycle value, how it performs, lasts, and saves costs over time?**

**Will the coating withstand the rigours of transport and construction?**

**Can the coating be applied efficiently in our setup?**

**Does the solution support our sustainability goals?**

**Is there a way to simplify the DFT specification process to reduce waste?**

These questions help to ensure the solution aligns with performance, efficiency and long-term value.

# Getting DFTs and estimations right

When it comes to passive fire protection, every micron matters. The dry film thickness (DFT) of an intumescent coating is what ultimately determines how long your steel will resist failure in a fire. But turning design specifications into a reliable, defect-free application is where theory meets the real-world challenge for applicators and fabricators.

**Why DFTs matter**

- **Safety first:** Safety first: Fire resistance stability ratings (R30, R60, R90, R120, R180, or R240+ minutes) depend on your ability to get the DFT correct. If too thin, the fire performance is not achieved. If too thick, you risk cracking, wasted coating or even compromising fire performance.
- **Steel sections differ:** A heavy I-beam doesn't need the same thickness as a slender hollow section. The section factor (Hp/A ratio) and geometry drive DFT coating thicknesses; every estimate should reflect this.

**DFT loadings in practice**

- **Product optimised for higher efficiency:** The less coating required to meet fire ratings, the faster and more cost-effective the job. The Hempafire Pro 400 solution delivers excellent DFTs with lower overall consumption and quicker application than many conventional intumescent options.
- **Plan your volumes:** Accurate loading data helps avoid over-ordering, which ties up capital and generates waste, or under-ordering, which risks costly project delays.
- **Account for coat backs on unprotected attachments:** Consider coat backs for unprotected members and minor attachments framing into your fire protected steelwork.
- **Don't forget touch-ups:** Damage during transport and erection of coated steel is not uncommon. Factoring in a realistic allowance for repair and touch-ups avoids extra downtime.

**In-shop vs. on-site application**

- **In-shop:** Epoxy intumescent, such as Hempafire Extreme 550, excels in a controlled shop environment. It can be applied in higher builds, with predictable drying and curing conditions, and minimal weather delays, reducing the risk of overspray, rework, or environmental exposure.
- **On-site:** Waterborne intumescent like Hempafire Optima 500 offers flexibility for large structures that can't be fully coated before transport. They provide lower-VOC, easier to apply on location, but require tighter process control due to weather, humidity, and temperature variation.

# Optimised DFTs

Critical steel temperature (CCT) is the point at which a steel member would no longer safely carry its applied load. It isn't a single number, it depends on how heavily the steel is loaded. Optimised intumescent coatings are specified at a dry film thickness that keeps the steel below this temperature for the required fire resistance period, avoiding unnecessary thickness.

**Balancing steel size and fire protection cost**

By considering the steel section size and its influence on the section factor (Hp/A ratio), the required DFT of the intumescent coating can be adjusted – either to meet compliance or to reduce material and application costs through value-engineering.

**Details make a difference**

Member type, member orientation, cellular beam, timber, composite design, concrete-filled member, etc. affects the DFT specification. Considering these early in the design can help avoid excessive coating and unnecessary cost.

**Early collaboration pays off**

When Hempel is involved early in the design phase, we can help fine-tune steel profiles and fire protection strategies – minimising unnecessary coating thickness and volumes, cutting project costs, and keeping everything code-compliant.

## HEET Dynamic:
## **Make fast and confident estimates**

Manual calculations of DFTs and volumes are time-consuming and prone to error. That's why Hempel developed HEET Dynamic – a free estimation tool, which in a few clicks:

- Delivers accurate DFT calculations in seconds
- Provides volume estimates per profile and fire rating
- Integrates with BIM and Structural Fire Design (SFD) workflows
- Helps you plan coatings, reduce over-ordering, and minimise waste

# What PFP coating should you choose?

Now that you've considered the key questions, it's time to look at the solutions that meet those demands: coating solutions designed to perform, protect, and support the success of the entire project.

In general, Hempel's intumescent systems for cellulosic fires are designed to deliver:

**Fast-drying, high-build coatings for efficient throughput**

**Durability that withstands mechanical exposure during construction**

**Compliance with international standards**

**Low VOCs that support BREEAM and LEED certifications**

**Reduced $CO_2$ emissions**

When suggesting a PFP coating system from Hempel, consider the project's primary objectives. We offer a wide range of PFP solutions for structural steel, ranging from the most durable one for extreme conditions with high humidity or salinity to the most environmentally friendly one that meets the strictest environmental standards.

Below, we present two options from each side of the spectrum: Hempafire Extreme 550 and Hempafire Optima 500. Based on your project focus, here are the specific benefits of each of the two solutions:

**If superior durability and a high fire rating are your focus:**

## HEMPAFIRE EXTREME 550

A two-component epoxy solvent-free intumescent solution mainly for in-shop applications. Ideal for protecting structural steel in demanding industrial and commercial areas and for projects with extended fire requirements.

### SPECIFIC BENEFITS

- **Fire protection of steel for up to 4 hours**
- **Up to 40% lower paint consumption compared to conventional epoxy intumescent coatings**
- **High mechanical strength minimises touch-ups after transport**
- **Durability beyond 25 years of protection, even in extreme environments**

**If environmental sustainability and productivity are your focus:**

## HEMPAFIRE OPTIMA 500

An eco-friendly, one-component waterborne intumescent solution supporting green building certifications with ease. With faster drying time and fewer costs, this painting helps you boost productivity.

### SPECIFIC BENEFITS

- **Fire protection of steel for up to 180 minutes**
- **Very low VOC and $CO_2$ emissions**
- **Optimised for off-site as well as on-site applications**
- **Fast application and drying time**

Using a single-source supplier means the full coating system – primer, intumescent, topcoat – is designed, tested and certified to work together. This reduces the risk of failures caused by mismatched products and ensures fire protection, corrosion resistance, and aesthetics stay aligned. And with fewer points of contact, simpler logistics, and a single accountable partner, challenges are resolved more efficiently, saving time and cost across the project.

Specific coatings needs or tricky project scenarios? Hempel is here to provide you with expert advice on the right coating, as well as the ideal system of primer, coating, and optional topcoat for a perfect finish.

# How Hempel supports your work

## Your PFP partner

Hempel offers services and our expertise to help you meet fire protection requirements with both speed and flexibility. Here's how:

### Advice on how to optimise your application setup

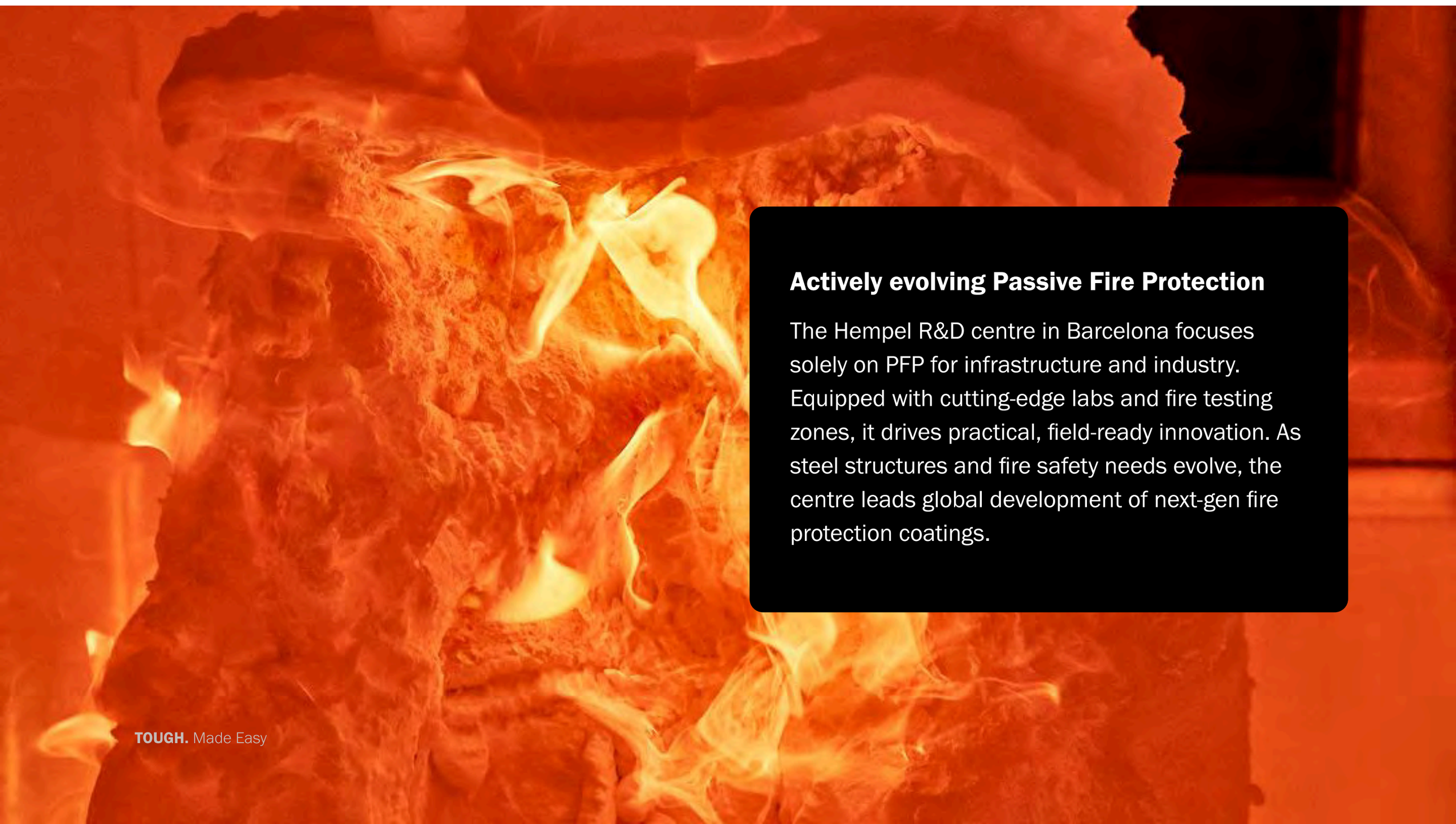
We offer a range of advisory services to choose from. From planning and specification through application and final curing, our expert coating advisors ensure your projects run efficiently and coatings are applied correctly and with less waste.

### Training and knowledge

Get access to our knowledge centre and explore articles, case stories and webinars that present the latest industry insights, including the fundamentals of PFP and intumescent coatings. Here you'll also find technical guidelines and updated information about coating standards.

### Global network for consistent support

Benefit from aligned specifications, coordinated logistics and reliable performance, no matter where your project is based. Our global presence helps ensure consistency across teams, regions and regulatory requirements.



### Actively evolving Passive Fire Protection

The Hempel R&D centre in Barcelona focuses solely on PFP for infrastructure and industry. Equipped with cutting-edge labs and fire testing zones, it drives practical, field-ready innovation. As steel structures and fire safety needs evolve, the centre leads global development of next-gen fire protection coatings.

# Common assumptions and how to counter them

Now you know what Hempel offers, so let's test them against some of the common myths you might meet in the construction project team:

**Myth 1:** "As long as it's PFP, any vendor will do."

**Reality:** The wrong choice can lead to rework, delays, and compliance issues.
Hempel offers technical service, training, and innovation that others don't.

**Myth 2:** "I just need the cost per square metre of PFP coating so I can compare suppliers."

**Reality:** PFP cost cannot be measured by a flat $m^2$ rate. The actual cost depends on steel section size (Hp/A), required fire rating, primers and topcoats, and whether in-shop or on-site application. Loadings also vary widely between profiles. Optimised systems like Hempafire Pro 400 reduce paint consumption and labour, delivering lower total cost and stronger sustainability outcomes.

**Myth 3:** "Architects care deeply about aesthetics."

**Reality:** Yes, that's why a PFP coating should not disrupt the building's architecture.
Hempel top coatings enhance the PFP coating with a consistent, durable finish in the indented colour. And most architects have broader design priorities, such as sustainability in the material choice.

**Myth 4:** "Once coated, steel can sit outside for months."

**Reality:** Not always. Exposure to sun and rain degrades some coatings, which are not optimised for long-term external exposure without a top coating, and rework might lead to quality issues. Predictable drying and curing times matter, as well as the optimal paint shop setup, which is why Hempel's products and services make sticking to the plan easier.

**Myth 5:** "We'll go with the coating we used last time — it worked well."

**Reality:** Every beam is unique. Every building serves a different purpose. That's why fire protection solutions must be tailored – not reused. Hempel provides expert guidance for all building types and structural members, staying at the forefront of coating standards and innovations.


# Final thoughts: let’s make tough easy

You’re not just applying paint to steel. You’re protecting lives, enabling progress, and making complex projects run smoothly. That’s no small task.

**We hope our guide helped you to:**

- **Cut through complexity**
- **Argue for the best solution**
- **Improve outcomes across the value chain**
- **Deliver performance, compliance, and efficiency — without compromise**

So next time someone says, “It’s just paint, we might as well use the PFP from our last project,” you’ll be equipped to explain why the choice deserves a closer look.

# **Need guidance?** Connect with our PFP experts

For more information on how advanced PFP coating solutions can safeguard your projects, enhance sustainability, and improve cost-efficiency, our experts are here to help. Whether you have questions or need product-specific advice, feel free to reach out.

**Find your local expert here**
**hempel.com**

## About Hempel

As a world-leading supplier of trusted coating solutions, Hempel is a global company with strong values, working with customers in the decorative, marine, infrastructure and energy industries. Hempel factories, R&D centres and stock points are established in every region.

Across the globe, Hempel's paints and coatings can be found in almost every country of the world. They protect and beautify buildings, infrastructure and other assets, and play an essential role in our customers' businesses. They help minimise maintenance costs, improve aesthetics and increase energy efficiency.

At Hempel, our purpose is to shape a brighter future with sustainable coating solutions. We firmly believe that we will succeed as a business only if we place sustainability at our heart. Not only is it the right thing to do, it will strengthen our competitive position, make ourselves more resilient and reduce our risk.

Hempel was founded in Copenhagen, Denmark in 1915. It is majority owned by the Hempel Foundation, which ensures a solid economic base for the Hempel Group and supports cultural, social, humanitarian and scientific purposes around the world.

**HEMPEL GROUP HEAD OFFICE**

Hempel A/S
Lundtoftegaardsvej 91
2800 Kgs. Lyngby
Denmark

Tel: +45 4593 3800
hempel@hempel.com
www.hempel.com