

Chartek

Trusted epoxy passive fire protection



Chartek is renowned for providing high quality, reliable fire protection for the oil and gas industry

Providing dependable intumescent epoxy passive fire protection solutions for over 40 years

Born in the 1970s from NASA's Apollo space program Chartek® was the world's first epoxy intumescent passive fire protection material.

Chartek® technology became a perfect fit with the needs of the oil industry as the cement based materials used at the time were found to lack the durability required to survive the effects of harsh offshore environments.

Formulated to provide long term corrosion and fire protection, Chartek® is the most used epoxy passive fire protection in the oil and gas industry; the first choice for all the world's oil majors.



The Chartek® brand has an unequalled track record of protecting oil and gas installations against explosion, hydrocarbon pool and jet fires. Chartek® products can be found on the world's offshore platforms, floating production storage and offloading vessels (FPSOs), refineries, petrochemical plants, liquified natural gas (LNG) terminals and liquified petroleum gas (LPG) storage facilities in environments as diverse as the North Sea, the Tropics and Antarctica.

As part of AkzoNobel, the world's largest coatings company, we can supply our high quality Chartek® products and services to projects anywhere in the world



Why fire protect?

Fire protection is a moral and legal requirement to ensure the safety of people at work. If appropriate fire safety provisions are not made, including epoxy passive fire protection, the economic and social effects of a fire could be catastrophic.

Fire protection is important for:

- Personnel protection – giving people time to escape or shelter from the effects of the fire
- Asset protection – minimizing damage to the steel structure before fire services arrive

How do Chartek® epoxy passive fire protection materials work?

Chartek® epoxy passive fire protection materials swell or 'intumesce' in a fire providing an insulating durable char layer that slows the temperature rise of the steel substrate.



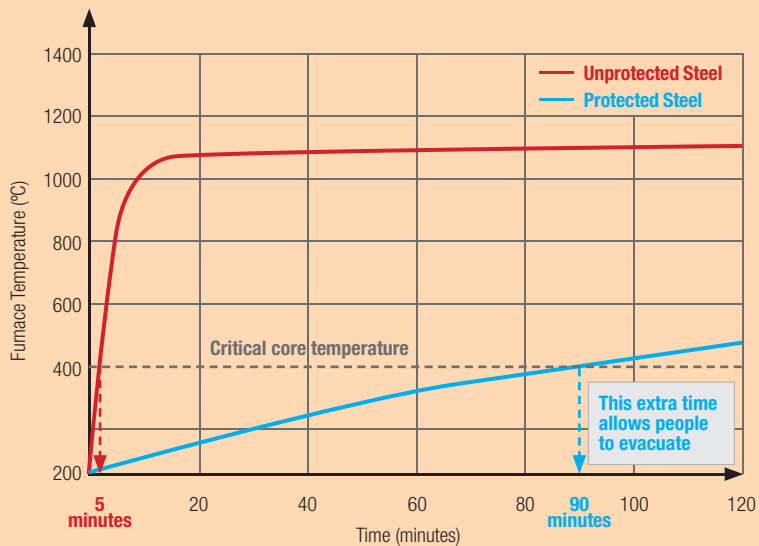
What happens in a hydrocarbon fire?

Unprotected steel experiences a rapid temperature rise.

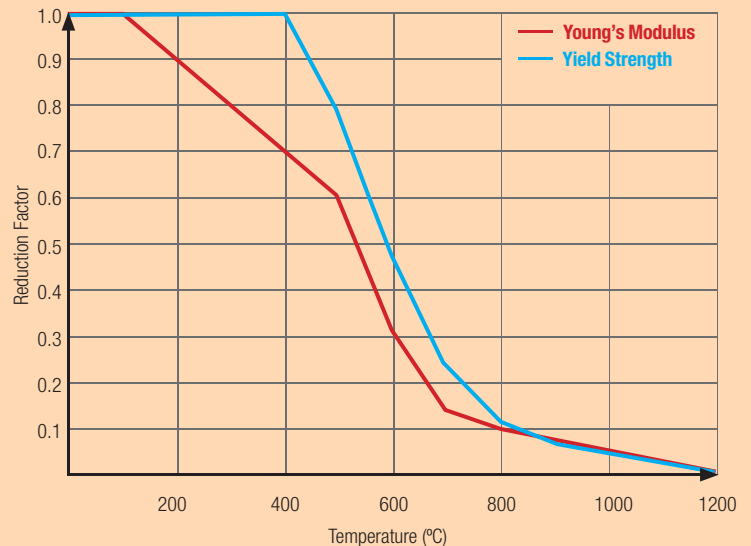
Chartek® materials help to protect steel from reaching its "critical core temperature" within a certain time period.

This critical core temperature is the temperature when steel starts to lose its load bearing capacity and can depend on the grade of steel used and its load bearing requirement.

Steel temperature



Mechanical properties of steel



The Chartek product range

Since the introduction of Chartek in the 1970s the Chartek product range has evolved to offer trusted solutions for hydrocarbon fires right across the oil and gas industry

Product range characteristics:	Chartek® 7	Chartek® 8	Chartek® 1709
Material	2 pack 100% solids epoxy	2 pack 100% solids epoxy	2 pack 100% solids epoxy
Target Oil and Gas Market	Offshore and Onshore	Offshore	Onshore
Jet Fire Protection	3 hours		
Pool Fire Protection	3 hours	2 hours	4 hours
Blast Resistance Overpressure	4 bar (no cracking or disbondment)	4 bar (no cracking or disbondment)	4 bar (no cracking or disbondment)
Corrosion Protection Approvals	ISO20340 / NORSOK M501 Edition 6, System 5A without a topcoat and System 7 Splash Zone	ISO20340 / NORSOK M501 Edition 6, System 5A without a topcoat	ISO20340 / NORSOK M501 Edition 6, System 5A without a topcoat
Mesh Requirements	Mesh required except when web size is less than 250mm	Mesh free for 1 hour pool fires	Mesh free for 1 hour pool fires then mesh only on flange tips
Key Certification	ISO22899 Jet fire	BS476 / ISO834 Hydrocarbon curve	UL1709 Hydrocarbon Pool fire
VOC	0g/L	0g/L	0g/L

Protects against corrosion under fire proofing (CUF)



Common types of passive fire protection like concrete based products are known to crack and disbond leading to corrosion under fire proofing (CUF). CUF causes the underlying steel substrate to corrode and lose its structural integrity.

If left untreated concrete cracking and disbondment can lead to:

- Dangerous fall drop hazards that can cause serious injury to innocent employees
- A drop in fire protection performance

Chartek's robust epoxy technology is extremely impervious to water ingress, is damage resistant and is virtually maintenance free providing long term corrosion protection. So once Chartek® has been installed, you can benefit from low product life cycle costs compared to other conventional fire protection products.



Ideal for offsite application

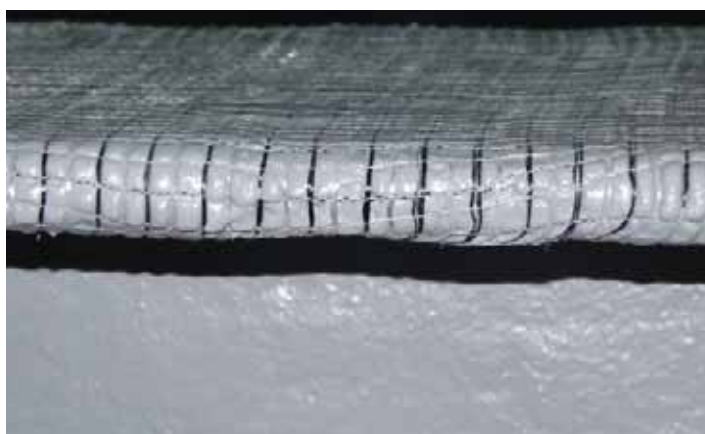
The product characteristics of Chartek® enhance productivity schedules...

- Suitable for spray, trowel or precast application techniques
- Simple and efficient contour application to complex shapes
- Rapid hardness development allows specified thickness to be quickly applied
- Tough, durable and resistant to impact and vibration damage
- Low installed weight

...and make it cost effective for offsite and modular construction projects compared to cementitious materials.



	Chartek®	Cementitious
Block outs (total area left to coat onsite)	<5%	>20%
Damaged area on arrival	Minimal	High
Transport Costs	Low	High
Scaffolding Costs	Low	High
	Low Onsite Costs	High Onsite Costs



Chartek® benefits from simple meshing requirements. Our patented HK-1 flexible mesh provides:

- Rolled in quick installation
- Easy cut to shape
- No need for metal pins

Rigorously tested to guarantee performance

Extensive certification to the most up-to-date fire standards

Chartek® is the most extensively 3rd party qualified epoxy intumescent material available today

The following list of external agencies provides an example of our qualifications:

- NORSOK
- BAM
- American Bureau of Shipping
- Bureau Veritas
- GOST
- Underwriters Laboratories
- Det Norske Veritas
- GASAFE
- Lloyd's Register of Shipping

Jet fire tested to ISO22899

Jet fires are extremely turbulent and destructive and so great care must be taken when writing jet fire protection specifications.

ISO22899 is the first and only internationally recognized jet fire standard used by classification societies.

The ISO22899 standard gives a way to assess epoxy passive fire protection jet fire resistance at different critical core temperatures and data assessment has shown lower critical core temperatures require more protection for the same jet fire duration.

The type approval should state the critical core temperature for which the certificate is valid so that it is clear under what conditions the thicknesses have been determined. This is the only way to ensure that specifications are correct for the required jet fire duration.

Chartek® 7 has ISO22899 type approvals for up to 3 hour jet fire durations for different critical core temperatures from class societies such as Lloyds Register and DNV.

Tested to extremes



In testing Chartek® has been shown to withstand up to 4 bar over pressure with no cracking or disbondment.



Certification is only part of the story. There is no substitute for infield performance. The picture below shows Chartek®'s condition after 20 years in the North Sea, with no evidence whatsoever of corrosion, cracking or delamination.





No need for topcoats to guarantee corrosion protection

Chartek® technology is in full compliance with both the ageing and fire protection requirements documented in ISO20340 and NORSOK M501 Edition 6 System 5A

Given that for most of its life epoxy passive fire protection acts as an anticorrosive system it is important that it has excellent long term durability and anticorrosion protection properties.

Chartek® meets, arguably, the most demanding accelerated corrosion standard used in the oil and gas industry today:

ISO20340 “Performance requirements for protective paint systems for offshore and related structures.”

The ISO20340 standard:

- Is used by **NORSOK M501 Edition 6 System 5A** to pre-qualify passive fire protection systems
- Assesses epoxy passive fire protection systems after exposure to 25 weeks of QUV/condensation, continuous salt spray and -20°C freeze cycles

The NORSOK M501 Edition 6 System 5A pre-qualification requirements recognize that the epoxy passive fire protection coating system itself must remain mechanically robust and able to provide both optimum corrosion protection and fire performance.

For this reason the standard expects the epoxy passive fire protection coating system to pass System 5A **without a topcoat**. This means that the epoxy passive fire protection coating system:

- ✓ Must have a minimum adhesion pull off value greater than 3MPa which is also more than 50% of its original unexposed value
- ✓ Must exhibit a corrosion creep value less than 3mm (1/8") when using a zinc primer
- ✓ Must have low water absorption (Chartek® is consistently less than 1% by weight) after test completion
- ✓ After exposure testing must demonstrate that the temperature does not rise greater than 10% with respect to a control

After ISO20340 exposure

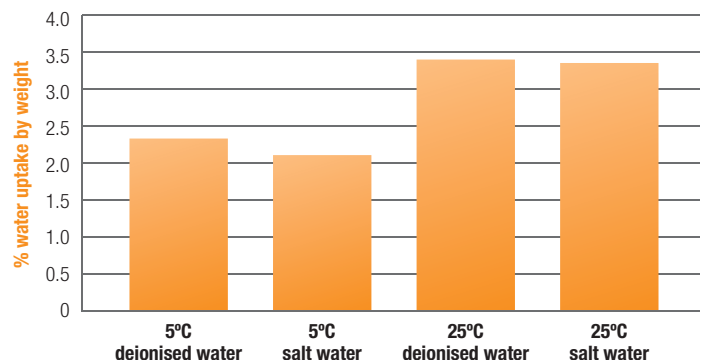


Chartek® shows low corrosion creep (<3mm)



Another commercially available epoxy passive fire protection product showing extensive corrosion creep (>10mm)

% water uptake by weight at saturation



Chartek around the world

Recognized for productivity benefits by all the world's major fabricators and shipyards

- Atlântico Sul
- COOEC
- DSME
- Dubai Drydocks
- HHI
- Aker Kvaerner
- McDermotts
- Keppel
- Kiewit
- SHI

Trusted by all the world's oil majors

- BP
- Shell
- Total
- Exxon Mobil
- ENI
- Chevron
- Petrobras
- Statoil
- ConocoPhillips
- CNOOC

Over 80% of the world's FPSOs protected with Chartek

Tens of millions of kilos of Chartek applied worldwide



Project name: Skarv FPSO, Norway
 Project year: 2008
 Owner: BP
 Yard: SHI, Korea



Project name: Golden Eagle, UK
 Project year: 2013
 Owner: Nexen
 Yard: Lamprell Energy, UAE



Project name: Hammerfest LNG, Norway
 Project year: 2005
 Owner: Statoil
 Yard: Fabricom, Belgium



Project name: Lunskoye A, East Russia
 Project year: 2003
 Owner: Sakhalin Energy
 Yard: SHI, Korea



Project name: Kashagan, Kazakhstan
 Project year: 2008
 Owner: Agip KCO
 Yard: Krasnye Barrikady Shipyard, Russia



Project name: Perdido SPAR, Gulf of Mexico
 Project year: 2009
 Owner: Shell
 Yard: Kiewit, USA



Project name: Adriatic LNG Terminal, Italy
 Project year: 2009
 Owner: ExxonMobil
 Yard: Dragados, Spain



Project name: Port Bonython HPP, Australia
 Project year: 2014
 Owner: Santos
 Yard: Aurecon



Project name: P-56, Brazil
 Project year: 2010
 Owner: Petrobras
 Yard: Keppel, Singapore



Project name: Akpo FPSO, Nigeria
 Project year: 2008
 Owner: Total
 Yard: HHI, Korea



Project name: Frade FPSO, Brazil
 Project year: 2008
 Owner: Chevron
 Yard: Dubai Drydocks, Dubai

Millions of square metres of steel protected by Chartek technology

● Chartek® application locations

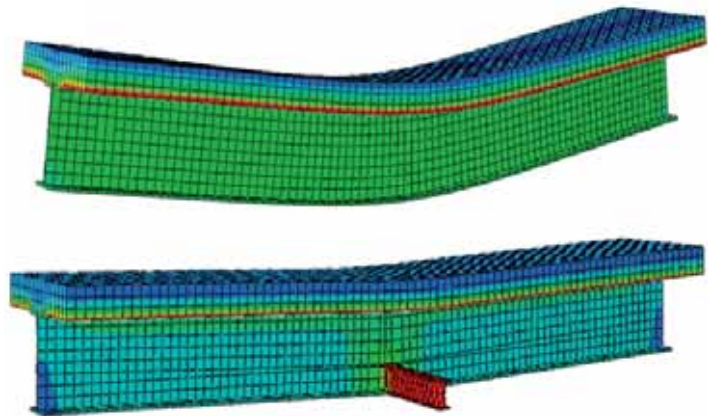
Global fire protection experts

The Chartek brand is not just about product performance. It is also about the technical service and support we provide every step of the way

Structural Fire Design

Right from the very beginning of your project our industry leading structural and fire engineering specialist team can work with you to review the passive fire protection requirements for your asset, providing:

- State-of-the-art computer modelling for structural response in a fire
- Bespoke structural member heat transfer modelling
- Optimized passive fire protection specifications



Bespoke Project Testing

Our state-of-the-art €7.5 million (10 million US\$) R&D facility allows us to carry out bespoke testing to satisfy our customers' individual project needs.

The facility contains:

- Screening furnaces
- Full scale furnaces
- Dedicated application facilities
- Environmentally controlled conditioning areas



Experienced onsite technical support teams around the world

We have a network of dedicated Chartek® technical service representatives with:

- Many years of experience in supporting Chartek® projects around the world
- Full understanding of yard practices and operating conditions

Ensuring passive fire protection is applied correctly is vital to ensure long term fire and durability expectations are met. This is why, since the early days of Chartek® fireproofing we only use qualified application companies trained in all aspects of Chartek® installation.

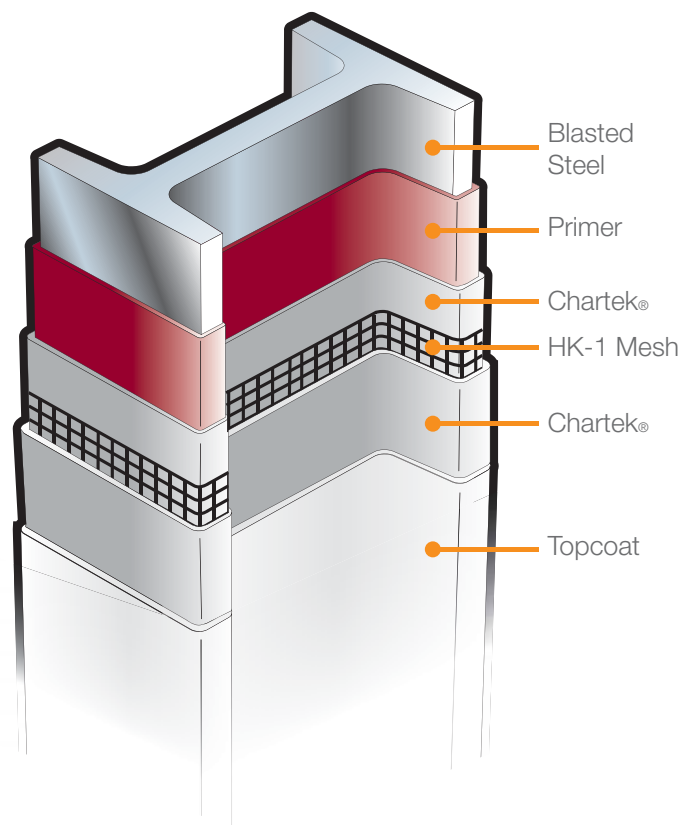




Complete solutions for fire and corrosion protection

With a comprehensive range of primers and topcoats we can provide you with one point of contact for all your protective coating and fire protection needs.

- Consistent product performance
- Products are manufactured and stocked globally
- All products are made to ISO9001 and ISO14001 quality standards



Customer testimony

“The key factors we considered with regards to specifying the right coating and fire protection systems were worldwide availability, the provision of technical support, quality control during application and relevant offshore references such as NORSOK approval. Choosing Chartek® as the passive fire protection product to be used throughout the project and being able to utilize protective coatings from the same manufacturer who provided excellent technical support during engineering and design phase was a great benefit.”

Rolf Schwerdtfeger, Senior Construction Engineer, Linde AG

Chartek

**The original and most widely requested
total asset fire protection package**

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