

Epoxy intumescent coatings and passive fire protection



FACT SHEET

FIRE 101

There are two main types of fires: cellulosic and hydrocarbon.

- Cellulosic fires are fueled by paper and wood and general building materials.
- Hydrocarbon fires are fueled by oil, fuels, and chemicals (liquids or gases) and reach higher temperatures faster than cellulosic fires.
 - Hydrocarbon pool fires are described where the fuel source is static, for example an oil or fuel spill ignites.
 - Hydrocarbon jet fires are described as combustion with significant momentum, for example the September 11, 2001 World Trade Center attacks or the Deep Water Horizon explosion.

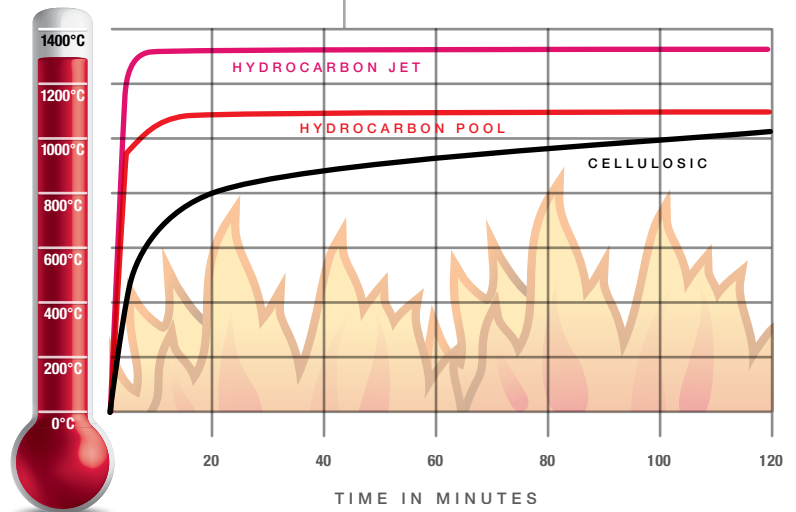
ACTIVE VERSUS PASSIVE FIRE PROTECTION

There are two different categories of fire protection: Active Fire Protection and Passive Fire Protection.

- Active Fire Protection includes methods to actively attack fire, for example: sprinkler systems, chemical systems, fire extinguishing systems.
- Passive Fire Protection (PFP) though opposite of what the name depicts, is always at work. PFP refers to making structures more resistant to fire by insulating them from high temperatures and as a result 'buying time' for the evacuation before structural collapse.

WHAT ARE PASSIVE FIRE PROTECTION MATERIALS?

As temperature of structural steel rises, the steel gets weaker. Materials, such as cementitious or intumescent fireproofing coatings cover and insulate structural steel, keeping it below the temperature at which strength is compromised.



Hydrocarbon fires reach high temperatures faster than cellulosic fires. Passive fire protection coatings are rated by how long they can withstand temperatures from different types of fires.

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Two types of Industrial Fireproofing:

1. Cementitious fireproofing is a cement-based material that provides fire protection through its inherent insulative properties. It acts as a thermal barrier to the steel to keep the temperature below the failure temperature. Steel is typically primed to combat corrosion prior to either spray or trowel application.
2. Epoxy (or mastic) intumescent coatings are typically 100% solids epoxy based materials. Epoxy based coatings help combat corrosion, making them ideal for high risk environments. Epoxy fireproofing is most efficiently sprayed via heated plural component airless equipment.

Both cementitious and epoxy intumescent fireproofing are applied to vessels, tanks, structures and substrates in refineries, onshore and offshore facilities, and petrochemical plants, or in buildings and facilities that could be exposed to hydrocarbon fires.

Commercial Fireproofing:

Often referred to as thin-film intumescent coatings, these acrylic-based materials are often used in interior commercial settings. Commonly rated for cellulosic fires, these coatings can be applied with standard airless spray equipment. Applications include office buildings, health care facilities, multi-family housing units, hotels, restaurants and schools.

WHAT IS THE APPLICATION PROCESS FOR EPOXY INTUMESCENT COATINGS?

The application of intumescent coatings takes place in either a fabrication/portable shop or at the job site prior to installation. The process for fire proofing is a three step process.

- Prepare and/or prime the surface which is important to ensure the strongest bond between the structural steel and protective coating.
- Apply the intumescent coating with single leg (Xtreme® PFP) or plural component (XM™ PFP) airless spray equipment.
- Often, depending on the fire rating and thickness required, reinforcement mesh is rolled in between layers of the coating. This mesh helps to keep the char intact during the intumescent process.

When applying the coating to the structure, the general rule of thumb is thicker steel means less coating and thin steel means more coating to insulate the steel. There are tools and formulas for calculating the thickness required to achieve a specific fire rating.



Before

After

This photo illustrates how an intumescent coating creates a char when exposed to heat.

FACT SHEET

HOW CONTRACTORS DETERMINE MATERIAL USAGE

Applicators bid projects by the weight of the material that will be applied to the steel. In general terms, the amount (or weight) of material required for an application will depend on the fire rating required. The fire rating for a particular piece of steel will be achieved by building the material to a specific thickness.

Example 1:

A 1000 ft² surface needs 416 mils (0.416 in) of coating for a 2-hr fire rating.

The weight of material needed is as follows:

Weight = [density] x [dry film thickness] x [surface area]

Weight = [62.4 lb/ft³] x 416 mil x (1 in/1000 mil) x (1 ft/12 in) x [1000 ft²]

Weight = 2163 lb of material

Each kit is around 110 lb

The customer would need about 20 kits of material to complete the job.

The price of material can be around \$7/lb so it would cost \$15,141 for this project in material (\$15/ft²).

An experienced contractor spraying with a plural component rig can apply around 30 kits per day.

Example 2:

A 100 m² requires 416 mils (0.416 in) of coating dry film thickness for a specific fire rating.

Density: 62.4 lb/ft³ = 1000 kg/m³

DFT: 416 mils = 0.01057 m = 10.57 mm

Weight = [density] x [dry film thickness] x [surface area] = 1000 kg/m³ x 0.01057 m x 100 m²

Weight = 1057 kg of material

Each kit is approximately 50 kg

The customer would need about 22 kits of material to complete the job.

WHERE CAN I GO TO LEARN MORE?

- Graco Online Training resources
- Graco.com for XM PFP product literature
- Videos posted on graco.com
- Material suppliers for passive fire protection materials



Applying passive fire protection material to steel beams.