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PASSIVE FIRE PROTECTION OF STEEL STRUCTURES WITH PROTHERM LIGHT

Steel is an efficient structural material but sensitive to heat: above a certain temperature it rapidly loses load-bearing capacity. Passive protection must therefore be sized according to the required fire resistance class and the section factor. Edilteco's Protherm Light offers a cement-based solution for beams, columns and structural steelwork.

Edilteco S.p.A.

The fire protection of steel structures is a central issue in the fire safety design of industrial, commercial and residential buildings. Steel offers lightness, fast erection and high mechanical performance, but its behaviour in a fire calls for specific attention: as the temperature rises, the strength and elastic modulus of the material decrease, to the point of compromising the load-bearing capacity of the element.

For the structural designer and the fire safety professional, therefore, passive protection is not a detail to be settled later, but a choice to be integrated into the overall safety strategy.

Why steel must be protected from fire

Steel is a non-combustible material, but that does not make it fire-resistant. The problem is not combustion but the loss of mechanical performance at high temperatures. At around 500–550 °C, structural steel retains only a fraction of its strength at room temperature: this is the range in which the **critical temperature** of the element lies.

Without protection, a section exposed to fire quickly reaches this threshold. The aim of passive protection is to slow down the rise in steel temperature, keeping it below the critical temperature for the time required by the fire resistance class.

Fire resistance classes and section factor

The fire resistance required of a structure is expressed in classes (for example R 30, R 60, R 90, R 120), which indicate for how many minutes the element must maintain its load-bearing capacity in fire conditions.

However, the sizing of the protection also depends on the geometry of the element, summarised by the **section factor** (the ratio between the exposed perimeter and the area of the section). Slender sections, with a high section factor, heat up more quickly and, for the same class, require greater protection thicknesses. Correct sizing therefore always starts from the combination of the required class and the section factor of the individual elements.

Steel structure protected with Protherm Light (University of Camerino)

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Protherm Light: cement-based protection for structural steelwork

Protherm Light® is the passive fire protection system developed by Edilteco, available as a cement-based plaster and as a panel. Applied to steel beams, columns and joints, it helps to limit the temperature rise of the structural element for the duration set by the fire resistance class.

The system is designed to adapt to the real geometries of structural steelwork, including complex sections and joints, where the continuity of the protection is decisive for overall effectiveness. The cement-based nature of the product and the high reaction-to-fire classes of its components make it consistent with the requirements of fire safety design.

Protherm Light on steel structures (Turin high-speed railway station)

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A coordinated approach between structure and fire strategy

The choice of the steel structure and that of its protection cannot be addressed separately. The structural designer and the fire safety professional must jointly define the required class, the section factors, the protection thicknesses and the installation methods, in line with the checks required by current regulations and by national fire prevention rules.

In this framework, tests according to the reference standards for the protection of steel elements (the **EN 13381** series, and **EN 1363-1** for the test conditions) are the technical tool that allows the designer to associate each configuration with the fire resistance class it can achieve.

Edilteco tools supporting designers

To support the design process, Edilteco provides dedicated installation manuals and assistance from its technical department, accompanying the designer from the definition of the thicknesses to the construction details. With Protherm Light, the passive fire protection of steel structures becomes a conscious design choice, sized to the real needs of the project.