Fire Protection Basics

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A variety of good options are available.

MINIMIZING THE POTENTIAL FOR A fire to occur, and protecting life and minimizing the extent of destruction if one does, are important goals for the design of any building. Fire loss mitigation in buildings can be achieved through a number of measures, such as fire prevention strategies, control of combustible and hazardous contents, provision of alarm systems, means of safe evacuation, fire-fighting access routes, adequate water supplies, active fire-fighting systems, building separations, compartmentation of premises, and structural fire resistance. The specific combination of fire mitigation measures in a building depends on the size and severity of associated risks and hazards. Structural fire resistance requirements often are prescribed in the applicable building code based on building occupancies, height, area, and other building characteristics. When fire resistance is prescribed for the structure, the associated objective can be described as a succinct inequality: Fire Resistance Fire Severity. To achieve this condition, the structure must resist collapse or failure during a fire of a specified severity.

Fire resistant materials and systems are designed to prevent or delay the temperature rise in structural steel so that the steel members can maintain adequate strength for the required duration. Ideally, this time allows for safe evacuation of the affected areas and fire-fighting operations, including search and rescue.

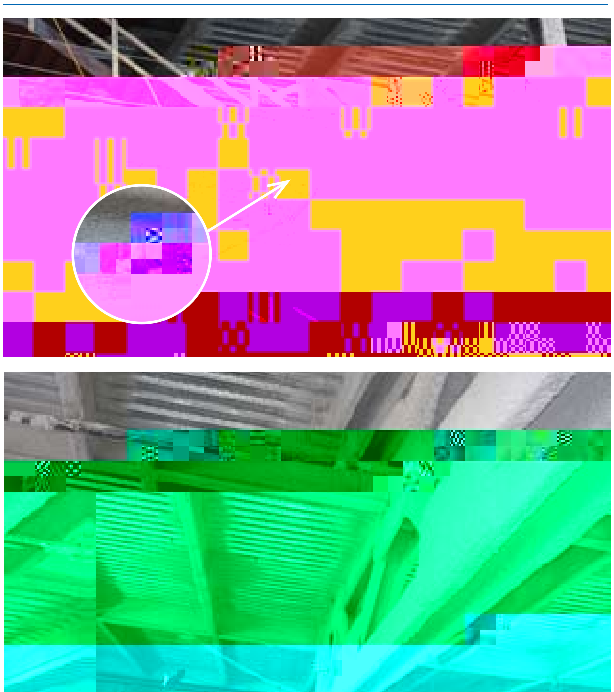

Figure 1: S SFRM C M H C SFRM.

Many technologies are available for protecting structural steel during a fire, and they use a variety of methods to achieve specified fire resistance ratings. This article provides a brief overview of different fire protection systems. For a more detailed look at this topic, see AISC Design Guide No. 19 *Fi R i u u F i*. That publication also provides references to common assemblies used in fire-resistant designs, such as the Underwriters Laboratories Inc. (UL) Fire Resistance Directory (www.ul.com).

Sprayed-On Protection

Spray-applied fire-resistant materials (SFRM) are most commonly used to protect structural steel. SFRM products are commonly classified by their in-place density as standard-density (13-18 psf), medium-density (22-30 psf), and high-density (40 psf and over).

Most SFRMs are of the wet-mix' product type (often referred to as cementitious fire protection'). The proprietary dry factory-premixed combination of gypsum or portland cement binders and lightweight mineral or synthetic aggregates is mixed with water on-site to form a slurry that is pumped and sprayed on the steel substrate. Some SFRM products are dry-mix' products (often referred to as fiber fire protection'). The proprietary dry factory-premixed combination of portland cement and inorganic binders combined with mineral wool is pneumatically pumped in a dry state on-site and mixed with water at the spray nozzle immediately before the application of the resulting slurry on the steel substrate.

Because SFRMs have proprietary formulations, it is imperative to closely follow the manufacturer's recommendations for mixing and application. Thicknesses required to achieve various ratings are typically provided by the manufacturer as well.

The biggest advantages of using SFRM are speed, efficiency, and cost-effectiveness. Surface preparation time is minimal for steel that

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is to receive a field-applied contact-type SFRM the steel need only be shop cleaned of dirt, oil, grease, and loose mill scale. The application of SFRM is relatively easy and fast; however, because it is a wet process, it can impact other trades. Also, protecting on-site areas from overspray is typically required.

It is important to avoid accidental or

steel decreases, the load is transferred to the concrete. The steel encasement and reinforcement helps limit the heat effects on the concrete, such as spalling and strength degradation. Ventilation