A third alternative for surface fire protection is the use of a thin intumescent coating. These may be up to 5mm thick, but thickness is typically only 1 to 2 mm. Although normally applied on site, these can now also be applied off-site by some fabricators. Such coatings have the same appearance as paint, and may be overcoated in a range of colours.

The use of off-site applied intumescent coatings is comparatively new. When this option is adopted care must be taken during transport and handling so that the coating is not damaged. This may involve the use of nylon slings instead of chains for lifting. A code requirement is that any damage is made good on site. A new industry standard has recently been published covering the off-site application of intumescent coatings([78]). The cost of off-site application is higher than the more traditional onsite application, but savings in time on site will often outweigh the higher costs.

Other ways of providing fire resistance

Traditionally, concrete encasement has been used to provide fire protection. This is often uneconomical unless the concrete serves an additional role, for example as a load carrying component, or to prevent impact damage to a column. Beams with concrete in-fill between the flanges are heavier and therefore more difficult to erect than plain steel beams. They also require placement of in-situ concrete at connection points.

The designer may be able to eliminate the need for fire protection altogether, by a careful choice of section, thus saving time and money, and possibly improving aesthetics. Alternatively, he may be able to reduce the thickness of protection needed. Fire resistance decreases as the section factor of a member increases. This factor is the exposed cross-section perimeter length divided by the cross-sectional area. Figure 7.11 indicates maximum allowable section factors to provide 30 minutes resistance for a variety of sections.([31]) Composite slabs with mesh reinforcement provide 90 minutes fire resistance, and concrete filled hollow section columns provide 60 minutes resistance or more depending on the reinforcement. The designer should also consider positioning steel members in walls, for example, to eliminate or reduce the requirement for supplementary fire protection.

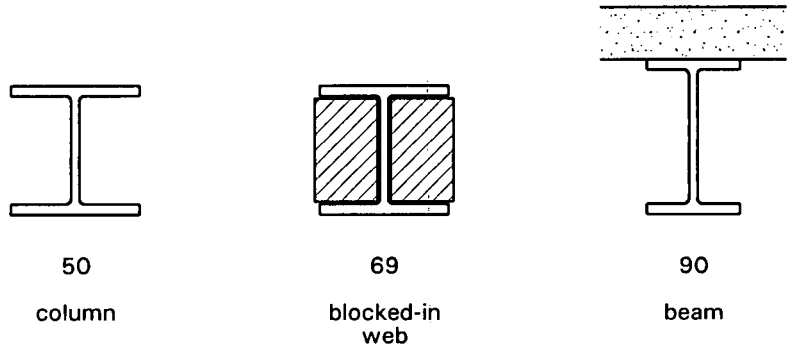

Figure 7.11 *Section factors to ensure 30 minutes resistance*

Many clients require active fire protection systems, such as sprinklers, to be installed for insurance reasons. As well as protecting the building, such 'active' systems reduce risks to occupants and contents. In these cases, the 'fire engineering' approach can be used to justify eliminating passive fire protection from many members.

KEY POINTS - Fire protection

The designer may choose any of the following options to provide the required fire resistance:

- spray: inexpensive, but messy and may interfere with other trades on site
- boards: look better than spray, more expensive
- intumescent coating: looks like paint, may prolong fabrication period, easily damaged, applied on or off-site
- concrete encasement: may serve another (e.g. structural) purpose
- increased section factor: reduce or eliminate the need for passive protection, thereby reducing site work
- sprinklers: eliminate passive protection, reduce risks to occupants and contents.

ACTIONS - Surface protection

The designer should ensure that:

- careful consideration is given to the different options available, since site requirements vary considerably
- specified layers of surface protection are mutually compatible
- protection is only specified when it's needed, so that unnecessary work is not carried out on site.

7.8 Further reading

(For further information, see Section 9, References)

Services

Services integration in modern steelframed buildings[62]. Part of the SCI interfaces series. This publication reviews the general requirements for building services, considers how different long span composite floor systems accommodate services, and compares the costs of different options.

Space allowances for building services distribution systems - detail design stage[66]. Gives sizes of standard ducts and fittings to enable the proper allocation and planning of service areas.