

ASFP Advisory Note 11:

‘ASFP’ position on the fire protection of cellular beams protected with reactive coatings



Background to fire protection of ‘cell beams’

It is well known that steel significantly loses strength as its temperature rises above 400°C to 550°C, a temperature soon exceeded in many fires. Consequently, there is a need to ensure that the temperature of the structural frame in a steel framed building is kept below certain limits to guarantee its structural performance in the event of a fire. This is traditionally achieved by encasing or spraying the steel sections with a variety of products and materials which insulate it for long enough to allow occupants to escape and to limit damage to the structure itself.

Cellular beams (beams with circular or rectangular opening(s) in the web) require a different approach when considering fire protection. Loaded fire tests on these types of beam show dramatically different reaction in fire than that observed with an equivalent solid web beam. Steel not only loses yield strength in fire, it also loses its stiffness, as measured by Young’s Modulus. This reduction in stiffness occurs at quite a low temperature (around 100°C). It is the combination of these two effects that can lead to complex forces occurring in the beam’s web, particularly around large penetrations. This can lead to web buckling effects among other complex modes of failure and as such it is imperative that the design of such beams is adequately considered.

Industry Guidance

To address this issue various design guides were drafted primarily by the UK’s Steel Construction Institute to deal with both ambient as well as fire condition design. Furthermore, the UK fire protection industry, in conjunction with the ASFP, developed an agreed fire test protocol which was published (and has since been modified) in the ASFP Yellow book (*Fire protection for structural steel in buildings*). This first appeared in the 4th edition but was modified in the 5th edition and this latest version has also been adopted (again marginally modified) for the European fire testing Standard that became EN13381 Part 9. An ISO Standard version which mirrors the EN Standard now also exists, ISO834 part 13.

For the engineering solution, earlier guidance versions only incorporated circular shaped apertures, but later versions included both circular as well as rectangular shaped apertures, hence why it is important to differentiate. It is also relevant that all previously issued engineering guidance has now been withdrawn and only SCI RT1356 or an equivalent independent design option is acceptable for the engineering solution. A European version of this is also currently being developed. Only the latest ASFP YB 5th edition, EN13381/9 or ISO 834/13 can be used to conduct new fire tests.

Cell beam certification

As this highly complex subject and as the design process has evolved over the last decade it has become apparent that not all aspects of the design and construction supply communities have kept pace with its evolution. Concern has been raised by some organisations that this could lead to unsafe design practices. Equally, the complexity and results of said testing has meant that it has thus far proved difficult for Third Party Certification bodies to produce a platform to adequately display such data in any “usable” format.

Consequently, an interim ASFP Register of tested reactive coatings has been produced so that there is a simple look-up table to demonstrate which products have been through this testing and to which protocol/version. The ASFP register further shows what the scope of third party assessment is, and entries have been verified as correct by the relevant third-party assessment body.

ASFP members have agreed that they will only specify and/or supply products that are listed on the ASFP Cell Beam Register for fire protecting cell beams with reactive coatings.

ASFP Recommendation

The ASFP strongly recommends that end users should only use reactive coatings that are on the ASFP Cell Beam Register. The register can be found here <https://is.gd/r6orH8>.

Annex – ASFP Publications relevant to fire protection of steelwork

Colour books

- Fire protection for structural steel in buildings (ASFP Yellow Book) 5th edition
<https://is.gd/r6orH8>

Codes of Practice

- ASFP TGD 8 Code of Practice for junctions between different fire protection systems
- ASFP TGD 10 Code of Practice for refurbishment of steelwork
- ASFP TGD 11 Code of Practice for overcladding intumescent coatings for fire protection
- ASFP TGD 13 Code of Practice for the specification & on-site installation of intumescent coatings for fire protection
- ASFP TGD 16 Code of Practice for off-site installation of intumescent coatings for fire protection <https://is.gd/FCjaV1>

Advisory notes <http://is.gd/I31BOH>

- ASFP Advisory Note 3 – Specifying steelwork fire protection
- ASFP Advisory Note 4 – Test & assessment procedures for solid rods protected with intumescent coatings