

Introduction

The latest guidance for the fire protection of cellular beams and castellated sections is contained in the ASFP Yellow Book - Fire protection for structural steel in buildings - 4th Edition (in section 6), and adopts the recommendations from the Steel Construction Institute as published in RT 1085.

To satisfy building design requirements, steel beams are now available with a variety of apertures created from the basic steel section size, during a secondary manufacturing process, to form deeper cellular beams than the parent beam. Alternatively, cellular beams can be created from three flat steel plates welded together. Castellated sections have hexagonal apertures. Whilst cellular beams are available with rectangular and/or 'elongated' aperture shapes, most apertures are circular in shape.

A large range of circular aperture sizes and spacing/pitch is available, and the dimensions of the residual 'web post' between adjacent openings can have a significant affect on the fire performance of the cellular beam.

The method of calculating section factor for cellular beams with apertures is therefore treated in a different manner than in the case of solid or hollow steel sections, because for any beam with closely spaced openings, the failure in fire will in most cases be caused by failure of the *steel web*. It is therefore important that the steel web temperature needs to be controlled. Moreover, the method of calculating section factor must be suitable for symmetric and asymmetric beams fabricated from hot rolled sections and for beams fabricated from steel plate.

Asymmetric steel beams may have different flange widths top and bottom. The position of the aperture may not be centrally located within the web of the beam.

In view of these variables, the **new ASFP 'passive rule'** for the fire protection of all cellular and castellated sections is now permitted, subject to the provisions listed below.

- a) That the Section factor [m^{-1}] is determined by the SCI method as published in RT1085 using:

*Section factor [m^{-1}] = 1400/t
where 't' is the thickness of the lower section steel web.*

- b) That the 'default' design temperature is the 'limiting temperature' for the steel cellular beam as determined and declared by the steel beam manufacturer, or a competent structural engineer, recognised by the Engineering Council. No proposal should be offered where the 'limiting temperature' is not provided.

The previous '550°C' default temperature is removed as inappropriate to all types of cellular beams. It is considered that the manufacturer's declared 'Limiting Temperature' for each beam will make sufficient provision for any effects from particular web-post dimensions and spacings, added stiffener plates, etc.

- c) The 'passive' fire protection product considered must have been tested and assessed for standard 'solid I-section beams'.
- d) The thickness of the 'passive' fire protection product /system will be determined from the section factor, the limiting temperature, and the fire protection product temperature tables, for the appropriate fire resistance period. This thickness will then be multiplied by 1.20 (*ie: increased by 20%*) - to provide a prudent and conservative generic solution.
- e) The maximum thickness of a profiled board or sprayed PFP system to be used must not exceed the maximum temperature or thickness as tested and assessed by an independent body on a loaded solid beam.
- f) The proposal for 'sealing' the PFP around the apertures in the cellular beam shall be covered by a suitable assessment from an independent body and deemed acceptable by a member of the ASFP Technical Review Panel.

AUTHORITY: Exova Warrington Assessment Report - WF Report No: 191655

Technical Data
Sheet – 145

Page 1 of 2
(Sept 2010)



Promat UK Limited
Technical Services Department
The Sterling Centre, Eastern Road
Bracknell, Berkshire RG12 2TD
Tel: 01344 381 400
Fax: 01344 381 401
E-mail: technicaluk@promat.co.uk

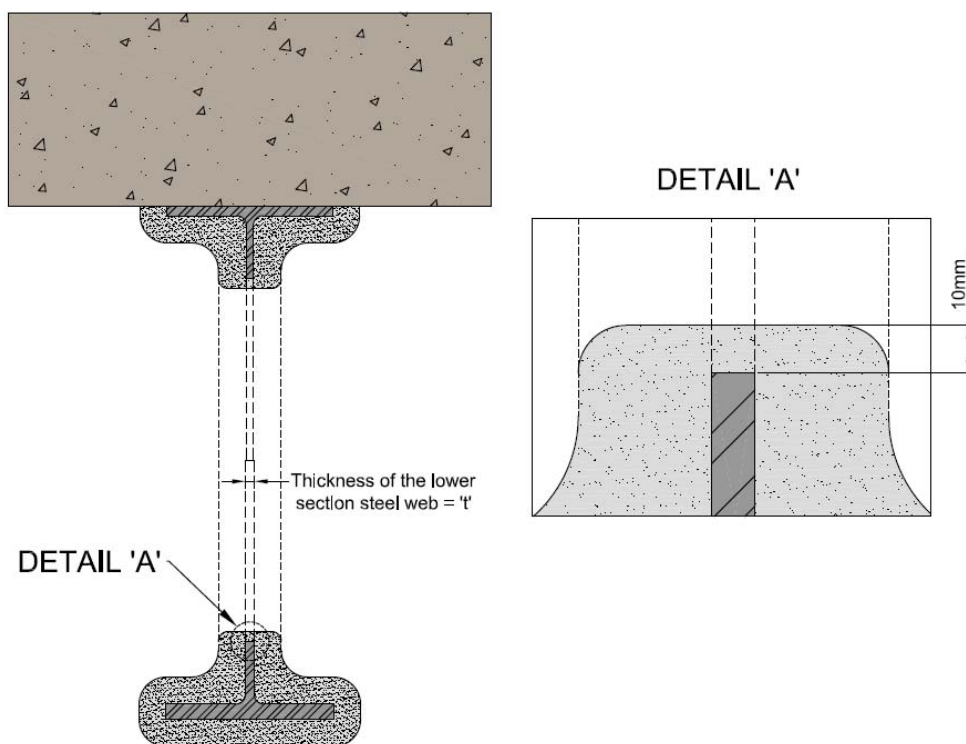


Application

Cafco MANDOLITE® CP2 spray coating has been specifically evaluated for the required treatment of the inner edges of the web openings on cellular beams, as required by the ASFP Yellow Book, and is now covered by an appropriate independent assessment report.

Based on the testing carried out, Cafco MANDOLITE® CP2 is suitable for fire protecting castellated sections and all cellular beams that contain circular or square openings, using the following procedure:

1. The appropriate protection thickness to the beam is determined on the basis of the following:
 - A design temperature provided by the structural engineer
 - The section factor, *calculated as 1400 divided by the lower web thickness*
 - The specified fire resistance period
2. For the specified fire resistance period, the thickness to be applied will be that for a solid beam with the same section factor, and design temperature – multiplied by 1.2
3. The thickness of Cafco MANDOLITE® CP2 protection around the inner edges of the holes (web openings) must be a minimum of 10mm when the required main beam protection thickness is greater than 10mm.



Other design consideration may be required, including that of any steel primer requirements (see technical data sheet TDS 130).

For instance, in cases where an Intumescent Fire Resistant Paint Coatings may have been previously applied, then the that coating *must be completely removed* back to bare metal for Cafco MANDOLITE® CP2 to be used.

The thickness of Cafco MANDOLITE® CP2 required, must be taken from the appropriate critical temperature table. Where an exact critical temperature does not coincide with a given temperature table, the next temperature table *below* the critical temperature must be used.

AUTHORITY: Exova Warrington Assessment Report - WF Report No: 191655

Technical Data Sheet – 145

Page 2 of 2
(Sept 2010)



Promat UK Limited
 Technical Services Department
 The Sterling Centre, Eastern Road
 Bracknell, Berkshire RG12 2TD
 Tel: 01344 381 400
 Fax: 01344 381 401
 E-mail: technicaluk@promat.co.uk

