

‘ASFP’ position on Portal Frame Buildings

Introduction

Portal frame rafters present a different challenge to normal structural steel in terms of fire protection. The performance of Portal frame rafters in fire has been very well studied historically. The SCI published a document P313 entitled “Single Storey Steel Framed Buildings in Fire Boundary Conditions”, which covers the design of portal frame buildings and also covers their behaviour in a fire.

The ASFP has verified with SCI, that the testing and assumptions within P313 are still appropriate.

Regulation/Requirements

Structural design guidance for portal frames in fire is given in SCI P313 which is currently referenced in design documents such as Approved Document B. Structural Engineers are advised to review this document alongside any associated design provisions provided by the project’s structural design code (e.g. BS 5950-8, Eurocodes or similar). This process will help to determine if fire protection is required to none, some or all of the structural members.

The advice below is regarding the treatment of rafters considers that these members are usually under-utilised. There is also a consideration that the roof structure will degrade under fire conditions, thus allowing the fire to vent and thereby reduce the maximum temperature within the structure (See SCI P313, section 3.13).

For the purposes of determining passive fire protection requirements, the ASFP recommend the following approach in the absence of a more detailed fire engineered assessment.

ASFP Advice on Portal Frame Sections

In accordance with section 2 (especially 2.9) and section 8.3 of SCI P313, columns should be protected using the appropriate critical temperature and certified column thicknesses. Where fire protection is required to portal frame rafters, the approach is to use the certified 4-sided beam thicknesses. The fire protection should be applied to all 4 sides of the rafter, using the appropriate critical temperature. For further information on critical temperatures see ASFP advice note x. ([insert link](#))

However, it is common that a portal frame rafter cannot be coated on the top flange if the roofing materials are in place. If portal frame rafters are protected in this way, it is assumed that the rafter protection is provided to slow the rate of collapse, i.e. it may not provide the full resistance period. In these cases, a structural engineer and/or fire engineer should be consulted, as further action may be required.

Care should also be taken to use the appropriate 4-sided section factor in all cases.