

TECHNICAL STUDY

Fireshield® Steel Intumescent Systems

Cladding intumescent coated internal structural steel up to 60 minutes FRR

INTRODUCTION

Fireshield® is frequently asked by Architects and Contractors alike if they can clad Fireshield® intumescent coated structural steel members with timber battens and plasterboard linings. Now you can.

Thin-film intumescent coatings swell in the event of a fire to produce an insulating layer to protect the steel below. If left unrestricted the expansion of the intumescent can be significant, see Photograph 1.



Photograph 1: Intumescent char expansion unrestricted during testing.

INDUSTRY STANDARD

In Australia and New Zealand, the ASFP Technical Guidance Document 13, *Code of practice for the over-cladding of reactive coatings when used as fire protection to steel structural sections*, March 2010, on expansion zone requirements is the typically accepted solution and best practice.

More recently the FPA New Zealand has published the Cop-03 Version 1.0 for the Specification and Application of Intumescent Coatings for the Fire Protection of Structural Steel which also contains guidance on cladding over coated steel sections and should be read in conjunction with the ASFP guidance in New Zealand.

The Technical Guidance 13 Document states:

Can external cladding systems be close fitted to structural steel surfaces which are protected from fire by intumescent reactive coatings?

ASFP STATEMENT

Where cladding systems are to be applied over an intumescent coating used for protecting steel sections from fire, in general, a minimum gap of 50 times the dry film thickness of the reactive coating is recommended to allow adequate expansion of the reactive coating in fire.

This guidance applies to the gap between the cladding and the flat surfaces of the protected steel section, as well as to flange tips, unless specific fire test data proves otherwise.

Gap sizes may be reduced where the reactive coating manufacturer has specific fire test evidence to justify the reduction for the appropriate period of fire protection.

Where the cladding is mounted onto continuous linear fixings/spacers, made of timber or metal, the spacers should be considered as a part of the main steel section and duly protected from fire, **unless other supporting fire test evidence can be provided to justify alternative action.**

The construction industry has highlighted that the expansion zone requirement can be challenging to achieve on-site; as a result, Fireshield® has undertaken testing to provide this guide.

The Fireshield® Technical Study has been conducted to analyse expansion zone requirements and provide technical justification for reducing the expansion zone when using Fireshield® intumescent coatings in conjunction with timber blocking and plasterboard linings through the use of fire testing.

Fireshield® acknowledges the above technical guidance in the absence of specific fire testing or other evidence to suggest that a reduced zone is appropriate.

STANDARD COMPLIANCE FIRE TESTING

Intumescent char expansion is not measured during standard fire testing for compliance purposes. Some product Manufacturers record the depth of the char expansion to help with the development and gain an understanding of their products.

During standard fire testing, it is not practical or feasible to test every bespoke architectural detail; this is left to the Manufacturer to undertake to evaluate the performance of the product and make a qualified recommendation.

FIRESHIELD FIRE TESTING: OVER-CLADDING

Fireshield undertook fire tests using the ISO 834-2:2019 fire curve with thermocouples placed as per BS476 testing to provide comprehensive recommendations on the expansion zones required when using Fireshield ArchitecturalWhite intumescent coating and to show the effects of timber strapping attached directly to the coated steel member for a period of 60 minutes.

The fire test was to ascertain the behaviour of a steel member coated with Fireshield ArchitecturalWhite, strapped with timber 50mm X 50mm battens and clad in 13mm standard plasterboard.

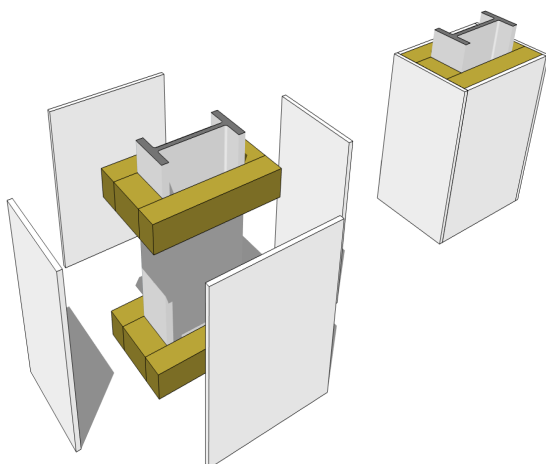
Two steel sections were used to compare the results, one reference column 01 below with intumescent only and one clad in plasterboard and timber strapping 02:

Steel Section 01: Reference Steel

Steel section size: 200UC46 column.
Intumescent: ArchitecturalWhite 1000µm DFT.

Steel Section 02: Clad Steel Section

Steel section size: 200UC46 column.
Timber Strapping: 50mm X 50mm timber @600ctrs.
Plasterboard: Standard 13mm plasterboard lining to 4 sides.
Intumescent: ArchitecturalWhite 1000µm DFT.



Drawing 1: Construction of Steel Section 02 for testing.



Photograph 2: Construction of Steel Section 02 for testing.

CONCLUSION

The test results show that non-fire rated 13mm plasterboard burns and falls away from the steel section at around 30 minutes and leaves the intumescent free to expand.

The fire test also shows that there are no detrimental effects to the steel section temperature due to the plasterboard cladding or from timber having direct contact with the steel member with zero room for char expansion.

Thermocouples placed beneath the timber strapping showed:

- Section 02 fully clad in timber and plasterboard performed better in the fire test reaching 550°C at **89 minutes**.
- The unclad steel Section 01 reference column reached 550°C at **60 minutes**.

RECOMMENDATIONS

This test evidence can be used to engineer a solution that allows the steel section to be coated with Fireshield ArchitecturalWhite intumescent coating and be clad in solid timber blocking.

This is a summarised version of the fire report, for a copy of the original detailed report, email info@fireshieldcoatings.com.