

# Fireshield® Steel Intumescent Systems

Cladding intumescent coated internal structural steel up to 120 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 with this test evidence.

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.

## INDUSTRY STANDARD

The Fire Protection Association of New Zealand has published the new Code of Practice for Intumescent Coatings to Structural Steel Version 1.0 which contains guidance on stand off distances when using intumescent coatings.

Generally, a gap of 50 times the dry film thickness of the coating should be provided to allow the intumescent coating to expand during a fire event. Cladding over intumescent coated steel sections is not permitted unless the intumescent Manufacturer can demonstrate through specific test evidence that the cladding/timber fixings will not prevent the intumescent from functioning during a fire event.

**This report applies to open and closed section profiles from 30 minutes to 120 minute protection using Fireshield Steel 1001 and Steel 1002 waterborne intumescent coatings.**

Architects, Specifiers and the construction industry as a whole 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.

*Can plasterboard cladding and/or timber framing be used in conjunction with or attached to a structural steel member protected from fire with an intumescent coating?*

### The FPANZ COP -03 Version 1 document states:

Where cladding systems or timber framing are to be used in conjunction with an intumescent coating for protecting steel members from fire, a gap of 50 times the DFT of the intumescent coating will generally need to be provided (for thin film intumescent coatings) to allow for full expansion of the intumescent coating during a fire.

**Gap sizes may be reduced only where the intumescent coating manufacturer has specific test evidence to justify a reduction for the specified period of fire resistance.** This guidance also applies to the gap between the cladding/framing and the flat surfaces of the protected steel section, as well as to flange tips.

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.**

## STANDARD COMPLIANCE FIRE TESTING

Intumescent char expansion is not measured during standard fire testing for compliance purposes. Here at Fireshield, we complete in house testing and record the depth of the char expansion to help with the development and gain an understanding of our 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.



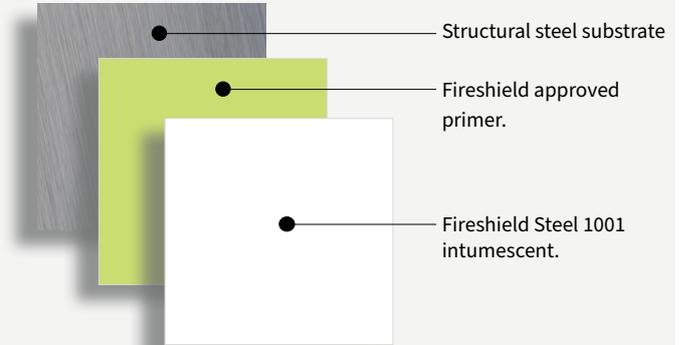
Photograph 1: Intumescent char expansion unrestricted during testing.

# Timber Strapping + Plasterboard to Coated Open Steel Sections

## 30 - 60 minutes FRR Steel 1001

### SYSTEM INFORMATION

- The system is for open steel sections in C1-C2 interior zones and consists of Steel 1001 + a Fireshield approved primer.
- A Fireshield approved top coat can also be added to the system.
- 30 to 60 minutes FRR** to structural steel open and closed structural steel members.
- Only to be applied by Registered Applicators in accordance with Fireshield Application Instructions, TDS and MSDS.



### FIRE TEST INFORMATION

<b>System Name</b>	Steel 1001-Clad-01 - 15 + yrs (No top coat) or 25 + yrs (with top coat) AS/NZS 2312.1:2014
<b>Steel Section 01</b>	Reference section 200UC46 steel section with Steel 1001 @1000µm DFT.
<b>Steel Section 02</b>	200UC46 steel section with Steel 1001 @1000µm DFT clad with timber and plasterboard detailed below. Plasterboard lining: 13mm standard screw or nail fix. Timber strapping: 50 x 50mm pine screw fixed, ctrs as per plasterboard fixing requirements.

### DESCRIPTION

- Fireshield undertook fire tests using the ISO 834-2:2019 fire curve with thermocouples placed as per BS476-3:2004 fire testing as per the FPA NZ COP-03 v1.
- Designed to provide comprehensive recommendations on the expansion zones required when using Fireshield Steel 1001 intumescent coating and to show the effects of timber strapping attached directly to the coated steel member.
- Two steel sections were used to compare the results, one reference column, **Column 01** above coated with Steel 1001 intumescent only and another steel column clad in plasterboard and timber strapping, **Column 02**.



Structural steel **Column 02** prior to fire testing clad with 50x50mm timber strapping.

### CONCLUSION

- The test results show that the 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.
- The unclad steel Section 01 reference column reached 550°C at 60 minutes as expected.
- 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.



Structural steel **Column 01** (reference column) after fire testing.

Structural steel **Column 02** (clad column) after fire testing.

### RECOMMENDATIONS

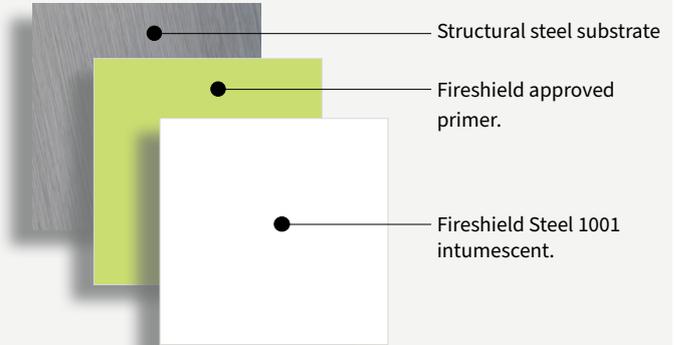
This test evidence can be used to engineer a solution that allows a structural steel section to be coated with Fireshield Steel 1001 intumescent and be clad in solid timber blocking with or without plasterboard linings attached. This is a summarised version of the fire report, for a copy of the original detailed report, email [info@fireshieldcoatings.com](mailto:info@fireshieldcoatings.com).

# Timber Framing + Plasterboard to Coated Hollow Steel Sections

## 30 - 60 minutes FRR Steel 1001

### SYSTEM INFORMATION

- The system is for SHS/RHS hollow sections installed into wall cavities in C1-C2 interior zones and consists of Steel 1001 + a Fireshield approved primer.
- A Fireshield approved top coat can also be added to the system.
- 30 to 60 minutes FRR** to structural steel open and closed structural steel members.
- Only to be applied by Registered Applicators in accordance with Fireshield Application Instructions, TDS and MSDS.



### FIRE TEST INFORMATION

<b>System Name</b>	Steel 1001-Clad-02 - 15 + yrs (No top coat) or 25 + yrs (with top coat) AS/NZS 2312.1:2014
<b>Steel Section 01</b>	Reference section 100mm X 100mm X 9mm SHS steel section with Steel 1001 @ 1070µm DFT.
<b>Steel Section 02</b>	100mm X 100mm X 9mm SHS steel section with Steel 1001 @1070µm DFT clad with timber and plasterboard as detailed below. Plasterboard lining: 13mm standard screw or nail fix. Timber framing: 90 X 45mm pine screw fixed, ctrs as per plasterboard fixing requirements.

### DESCRIPTION

- Fireshield undertook fire tests using the ISO 834-2:2019 fire curve with thermocouples placed as per BS476-3:2004 fire testing as per the FPANZ COP-03 v1.
- Designed to provide comprehensive recommendations on the expansion zones required when using Fireshield Steel 1001 intumescent coated hollow steel sections and to show the effects of timber framing and plasterboard attached directly to the coated steel member.
- Two steel hollow sections were used to compare the results, one reference column, **Column 01** above coated with Steel 1001 intumescent only and another **Column 02** clad in plasterboard and timber framing to simulate installation into a wall cavity.

### CONCLUSION

- The test results show that the 13mm plasterboard burns and falls away from the steel section at around 74 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 lining or from timber framing having direct contact with the steel member with zero room for char expansion.
- The unclad steel Section 01 reference column heated as expected reaching 260°C at 10 min and 400°C at around 30 min.
- Thermocouples placed beneath the timber strapping showed Section 02 fully clad in timber framing and plasterboard performed better in the fire test reaching 400°C at 79 minutes.

### RECOMMENDATIONS

This test evidence can be used to engineer a solution that allows a hollow structural steel section to be coated with Fireshield Steel 1001 intumescent and clad in solid timber framing with plasterboard linings attached to the opposite steel face as you would find in a standard 90mm timber framed wall. This is a summarised version of the fire report, for a copy of the original detailed report, email [info@fireshieldcoatings.com](mailto:info@fireshieldcoatings.com).



Structural steel **Column 02** prior to fire testing clad with 90x45mm timber framing and plasterboard hard against the steel face.



Structural steel **Column 01** (reference column) after fire testing.

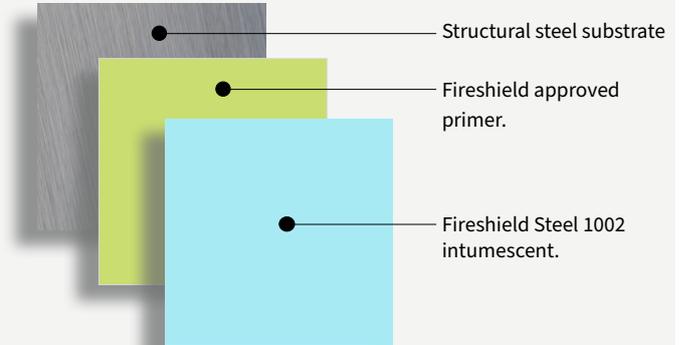
Structural steel **Column 02** (clad column) after fire testing.

# Timber Strapping + Plasterboard to Coated Steel Open Sections

## 30 - 120 minutes FRR Steel 1002

### SYSTEM INFORMATION

- The system is for open steel sections in C1-C2 interior zones and consists of Steel 1002 + Fireshield approved primer.
- A Fireshield approved top coat can also be added to the system.
- **Up to 120 minutes FRR** to structural steel open and closed structural steel members.
- Only to be applied by Registered Applicators in accordance with Fireshield Application Instructions, TDS and MSDS.



### FIRE TEST INFORMATION

<b>System Name</b>	Steel 1002-Clad-01 - 15 + yrs (No top coat) or 25 + yrs (with top coat) AS/NZS 2312.1:2014
<b>Steel Section 01</b>	Reference section 200UC46 steel section with Steel 1002 @ 4050µm DFT.
<b>Steel Section 02</b>	200UC46 steel section with Steel 1002 @ 4050µm DFT clad with timber and plasterboard detailed below. Plasterboard lining: 13mm standard screw or nail fix. Timber strapping: 50 X 50mm pine screw fixed, ctrs as per plasterboard fixing requirements.

### DESCRIPTION

- Fireshield undertook fire tests using the ISO 834-2:2019 fire curve with thermocouples placed as per BS476-3:2004 fire testing as per the FPANZ COP-03 v1
- Designed to provide comprehensive recommendations on the expansion zones required when using Fireshield Steel 1002 intumescent coating and to show the effects of timber strapping attached directly to the coated steel member.
- Two steel sections were used to compare the results, one reference column, **Column 01** above coated with Steel 1002 intumescent only and another steel column clad in plasterboard and timber strapping, **Column 02**.



Structural steel **Column 02** prior to fire testing clad with 50X50mm timber strapping.

### CONCLUSION

- The test results show that the 13mm plasterboard burns and falls away from the steel section at around 45 to 60 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.
- The unclad steel Section 01 reference column reached 550°C at 86 minutes as expected.
- 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 94 minutes.



Structural steel **Column 01** (reference column) after fire testing.

Structural steel **Column 02** (clad column) after fire testing.

### RECOMMENDATIONS

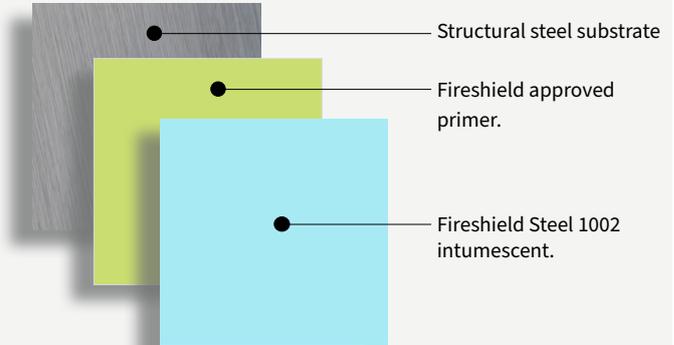
This test evidence can be used to engineer a 120 minute FRR solution that allows a structural steel section to be coated with Fireshield Steel 1002 intumescent and be clad in solid timber blocking with or without plasterboard linings attached. This is a summarised version of the fire report, for a copy of the original detailed report, email [info@fireshieldcoatings.com](mailto:info@fireshieldcoatings.com).

# Timber Framing + Plasterboard to Coated Hollow Steel Sections

## 30 - 120 minutes FRR Steel 1002

### SYSTEM INFORMATION

- The system is for SHS/RHS hollow sections installed into wall cavities in C1-C2 interior zones and consists of **Steel 1002** + Fireshield approved primer.
- A Fireshield approved top coat can also be added to the system.
- 30 to 120 minutes FRR** to structural steel open and closed structural steel members.
- Only to be applied by Registered Applicators in accordance with Fireshield Application Instructions, TDS and MSDS.



### FIRE TEST INFORMATION

System Name	Steel 1002-Clad-02 - 15 + yrs (No top coat) or 25 + yrs (with top coat) AS/NZS 2312.1:2014
Steel Section 01	Reference section 100mm X 100mm X 9mm SHS steel section with Steel 1002 @ 8045µm DFT.
Steel Section 02	100mm X 100mm X 9mm SHS steel section with Steel 1002 @ 8045µm DFT clad with timber and plasterboard as detailed below. Plasterboard lining: 13mm standard screw or nail fix. Timber framing: 90 X 45mm pine screw fixed, ctrs as per plasterboard fixing requirements.

### DESCRIPTION

- Fireshield undertook fire tests using the ISO 834-2:2019 fire curve with thermocouples placed as per BS476-3:2004 fire testing as per the FPANZ COP-03 v1.
- Designed to provide comprehensive recommendations on the expansion zones required when using Fireshield Steel 1002 intumescent coated hollow steel sections and to show the effects of timber framing and plasterboard attached directly to the coated steel member.
- Two steel hollow sections were used to compare the results, one reference column, **Column 01** above coated with Steel 1001 intumescent only and another **Column 02** clad in plasterboard and timber framing to simulate installation into a wall cavity.

### CONCLUSION

- The test results show that the 13mm plasterboard did not burn away from the steel section and stayed in place until 120 min.
- The fire test also shows that there are no detrimental effects to the steel section temperature due to the plasterboard lining or from timber framing having direct contact with the steel member with zero room for char expansion.
- The unclad steel Section 01 reference column heated as expected reaching 260°C at 45 min and 400°C at around 60 min.
- Thermocouples placed beneath the timber strapping showed Section 02 fully clad in timber framing and plasterboard performed better in the fire test reaching 400°C at 120 minutes.



Structural steel **Column 02** prior to fire testing clad with 90X45mm timber framing and plasterboard hard against the steel face.



Structural steel **Column 01** (reference column) after fire testing.

Structural steel **Column 02** (clad column) after fire testing.

### RECOMMENDATIONS

This test evidence can be used to engineer a 120 minute FRR solution that allows a hollow structural steel section to be coated with Fireshield Steel 1002 intumescent and clad in solid timber framing with plasterboard linings attached to the opposite steel face as you would find in a standard 90mm timber framed wall. This is a summarised version of the fire report, for a copy of the original detailed report, email [info@fireshieldcoatings.com](mailto:info@fireshieldcoatings.com).