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Fire assessment report

Structural steel protected with a combination of Nullifire intumescent coatings and other nominated protection systems

Sponsor: Tremco Construction Products Group

Report number: FAS210248 Revision: R1.1

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Quality management

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			Prepared by	**Reviewed by**	**Authorised by**
		Name	Imran Ahamed	Yomal Dias	Omar Saad
R1.1	Issue: 28/09/2021	Reason for issue	Report updated with latest construction details		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Sukhi Sendanayake	Imran Ahamed	Imran Ahamed
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			Prepared by	**Reviewed by**	**Authorised by**
	Expiry: 30/09/2026	**Name**	Edward Kwok	Imran Ahamed	Imran Ahamed
		Signature			

Executive summary

This report documents the findings of the assessment undertaken to determine the expected period of structural adequacy (PSA) at the interface between different structural steel fire protection systems – in accordance with AS 4100:1998 Incorporating Amendment 1 and AS 1530.4:2014.

This assessment report addresses the situations where a combination of Nullifire intumescent coatings – namely SC803 and SC901/902 – and structural steel fire protection spray or board is used to protect structural steel beams and columns.

The Nullifire SC803 and SC901/902 have been tested and assessed as a structural steel fire protection system – in accordance with AS 4100:1998 Incorporating Amendment 1 in fire assessment reports FC 11648-001 and FC 11812-001, respectively. As per the referenced fire assessment reports, Nullifire SC803 and SC901/902 are capable of providing PSAs up to 120 minutes for open section beams and columns, and hollow section columns. Similarly, the spray or board that is expected to be used along with Nullifire SC803 or SC901/902 coating at interfaces must have been tested and assessed as a structural steel protection system in accordance with AS 4100:1998 Incorporating Amendment 1.

Based on the discussion in section 5 of this report, the proposed interface construction details between the Nullifire SC803 or SC901/902 coating and the structural steel fire protection spray or board – if applied in accordance with the manufacturers' instructions following the guidelines stipulated in corresponding fire assessment reports – would not be detrimental to the overall fire resistance performance – if tested in accordance with AS 1530.4:2014. The overall PSA of the construction will be governed by the minimum PSA of Nullifire SC803 or SC901/902 coating and spray / board protected structural steel member.

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 6 of this report. The results of this report are valid until 30/09/2026.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the expected period of structural adequacy (PSA) at the interface between the Nullifire SC803 or SC901/902 coating and another structural steel fire protection system – in accordance with AS 4100:1998 Incorporating Amendment 1[1] and AS 1530.4:2014[2].

This assessment was carried out at the request of Tremco Construction Products Group.

The sponsor details are included in Table 1.

Table 1 Sponsor details

Sponsor	Address
Tremco Construction Products Group	12/4 Southridge street Eastern Creek NSW 2766 Australia

2. Framework for the assessment

2.1 Assessment approach

An assessment is an opinion about the expected performance of a component or element of structure if it was subject to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for doing these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2019[3].

This guide provides a framework for undertaking assessments in the absence of specific fire test results. Some areas where assessments may be offered are:

- Where a modification is made to a construction which has already been tested
- The interpolation or extrapolation of results of a series of fire resistance tests, or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product
- Where, for various reasons – eg size or configuration – it is not possible to subject a construction or a product to a fire test.

Assessments will vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

This assessment uses established empirical methods and our experience of fire testing similar products to extend the scope of application by determining the limits for the design based on the tested constructions and performances obtained. The assessment is an evaluation of the potential fire resistance performance if the elements were to be tested in accordance with AS 1530.4:2014.

This assessment has been written using appropriate test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been deemed appropriate to support the manufacturer's stated design.

1 Standards Australia, 1998, Steel structures, AS 4100:1998 (R2016) Incorporating Amendment 1, Standards Australia, NSW.
2 Standards Australia, 2014, Methods for fire tests on building materials, components and structures: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
3 Passive Fire Protection Forum (PFPF), 2019, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

2.2 Declaration

The 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal on 28 July 2021, Tremco Construction Products Group confirmed that:

- To their knowledge the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by a test authority in accordance with the standard against which this assessment is being made and the results are not in agreement with this assessment.
- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information – they agree to ask the assessing authority to withdraw the assessment.

3. Limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results that are expected if the system was tested and assessed in accordance with AS 1530.4:2014 and AS 4100:1998 including Amendment 1, respectively.
- The assessment is applicable for structural steel I/H section beams and columns. additionally, it is applicable to square, rectangular, and circular hollow section columns.
- The assessed interface details between the Nullifire SC803 or SC901/902 coating and another structural steel fire protection system must adhere with construction details as shown in Figure 1 to Figure 2.
- This report only addresses the scenario where the Nullifire intumescent paint is applied before the application of board or spray protection.
- The overall PSA of the construction will be governed by the minimum PSA of Nullifire SC803 or SC901/902 coating and spray / board protected structural steel member.
- The spray or board that is expected to be used along with the Nullifire SC803 or SC901/902 coating at interfaces must have been tested and assessed as a structural steel protection system in accordance with AS 4100:1998 Incorporating Amendment 1 – for their use by an Accredited Testing Laboratory (ATL).
- This report is only valid for the assessed systems and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions – other than those identified in this report – may invalidate the findings of this assessment. If there are changes to the system, a reassessment will need to be done by an ATL.
- The documentation that forms the basis for this report is listed in Appendix A.
- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.
- This assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials and maintenance, guidance on workmanship and the expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report.

4. Description of the specimen and variations

4.1 System description

This assessment report addresses the situations where a combination of Nullifire SC803 or SC901/902 coating and structural steel fire protection spray or board is used to protect structural steel beams and columns.

The Nullifire SC803 and SC901/902 have been tested and assessed as structural steel fire protection systems – in accordance with AS 4100:1998 Incorporating Amendment 1 in fire assessment reports FC 11648-001 and FC 11812-001, respectively. As per the referenced fire assessment reports, Nullifire SC803 and SC901/902 are capable of providing PSAs up to 90 and 120 minutes, respectively, for open section beams and columns, and hollow section columns. Similarly, the spray or board that is expected to be used along with Nullifire SC803 or SC901/902 coating at interfaces must have been tested and assessed as a structural steel protection system in accordance with AS 4100:1998 Incorporating Amendment 1.

This report therefore only addresses the performance of the interface between two structural steel protection systems.

4.2 Referenced assessment data

The assessment of the variation to the tested system and the determination of the expected performance is based on the results of the fire assessments documented in the reports summarised in Table 2. Further details of the assessed systems are included in Appendix B.

Table 2 Referenced assessment data

Report number	Assessment report sponsor	Issue date	Issuing authority
FC 11648-001	Nullifire, a division of Tremco Illbruck Coatings Limited	24 June 2019	BRANZ
FC 11812-001	Tremco Pty Ltd	4 June 2020	BRANZ

4.3 Variations to the tested systems

An identical system has not been subject to a standard fire test. We have therefore assessed the system using baseline assessment information for similar systems. The variations to the assessed systems – together with the referenced assessment reports – are described in Table 3.

Table 3 Variations to tested systems

Item	Reference assessment report	Description	Variations
Fire protection of structural steel	FC 11648-001 FC 11812-001	The referenced assessment reports permit to protect structural steel members using Nullifire SC803 and SC901/902 for PSAs up to 120 minutes. Refer the referenced assessment reports for specific limitations and outcomes.	It is proposed to protect structural steel beam and column joints by a combination of the Nullifire SC803 or SC901/902 coating and spray or board fire protection systems.

4.4 Referenced standards

AS 1530.4:2014 prescribes the heating conditions, test procedures and criteria for determining the fire resistance of an element of building construction. Section 2 of this standard contains the general requirements for conducting tests. Section 5 addresses the fire resistance testing of columns and section 6 addresses the fire resistance testing of beams.

AS 4100:1998 Incorporating Amendment 1 requires fire resistance tests in accordance with AS 1530.4 section 5 for columns and section 6 for beams to obtain the temperature of steel sections for a range of protection thicknesses and a range of exposed surface area to mass ratios. Based on

the test data, AS 4100:1998 Incorporating Amendment 1 section 12 provides a guideline to conduct an assessment to predict the performance of various steel sections with different protection thicknesses.

4.5 Construction drawings

Figure 1 to Figure 2 show the construction and treatment at the interface between the two structural steel protection systems.

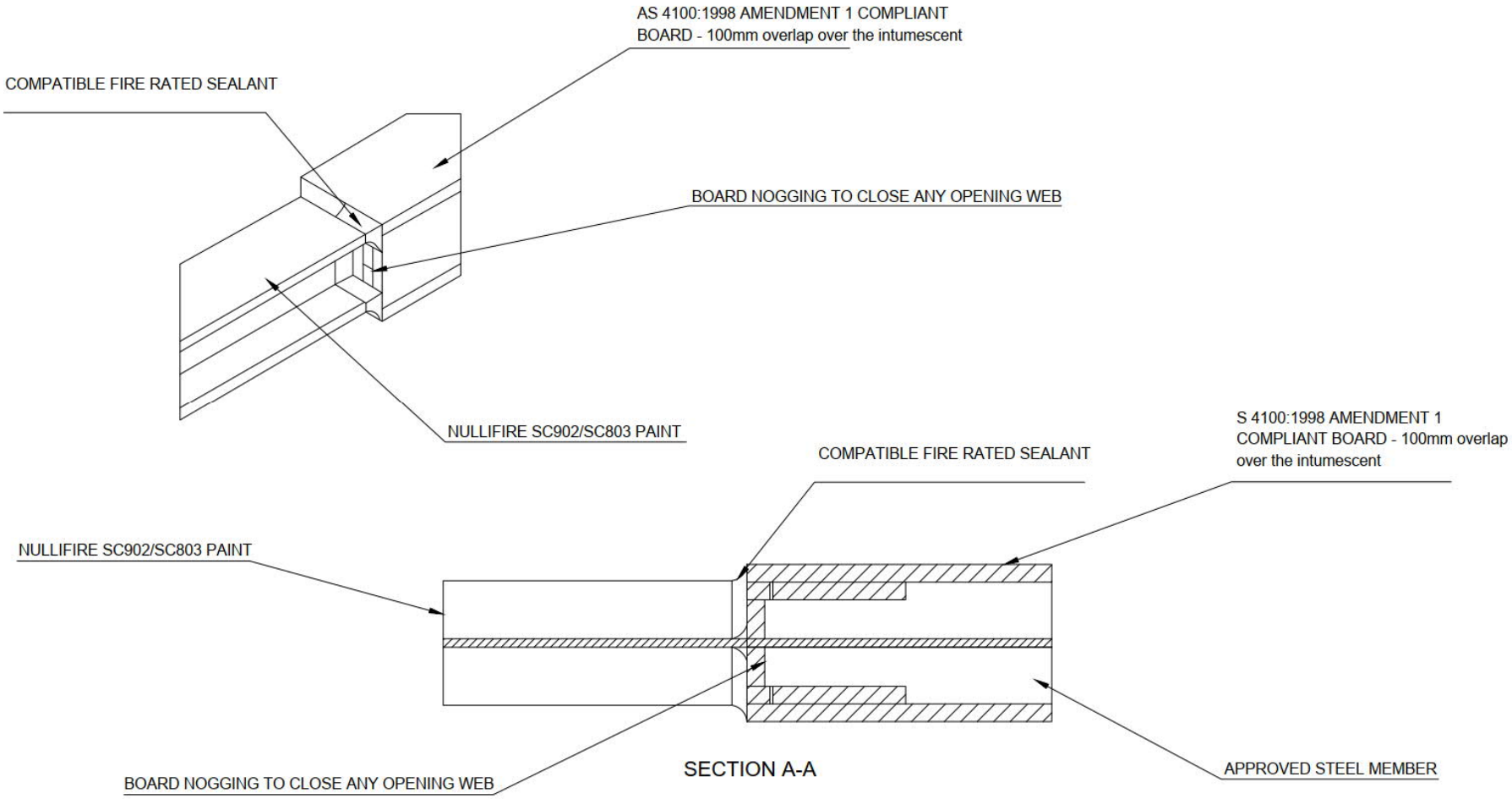

Figure 1 The construction detail when the board protection system is added next to the Nullifire intumescent coating

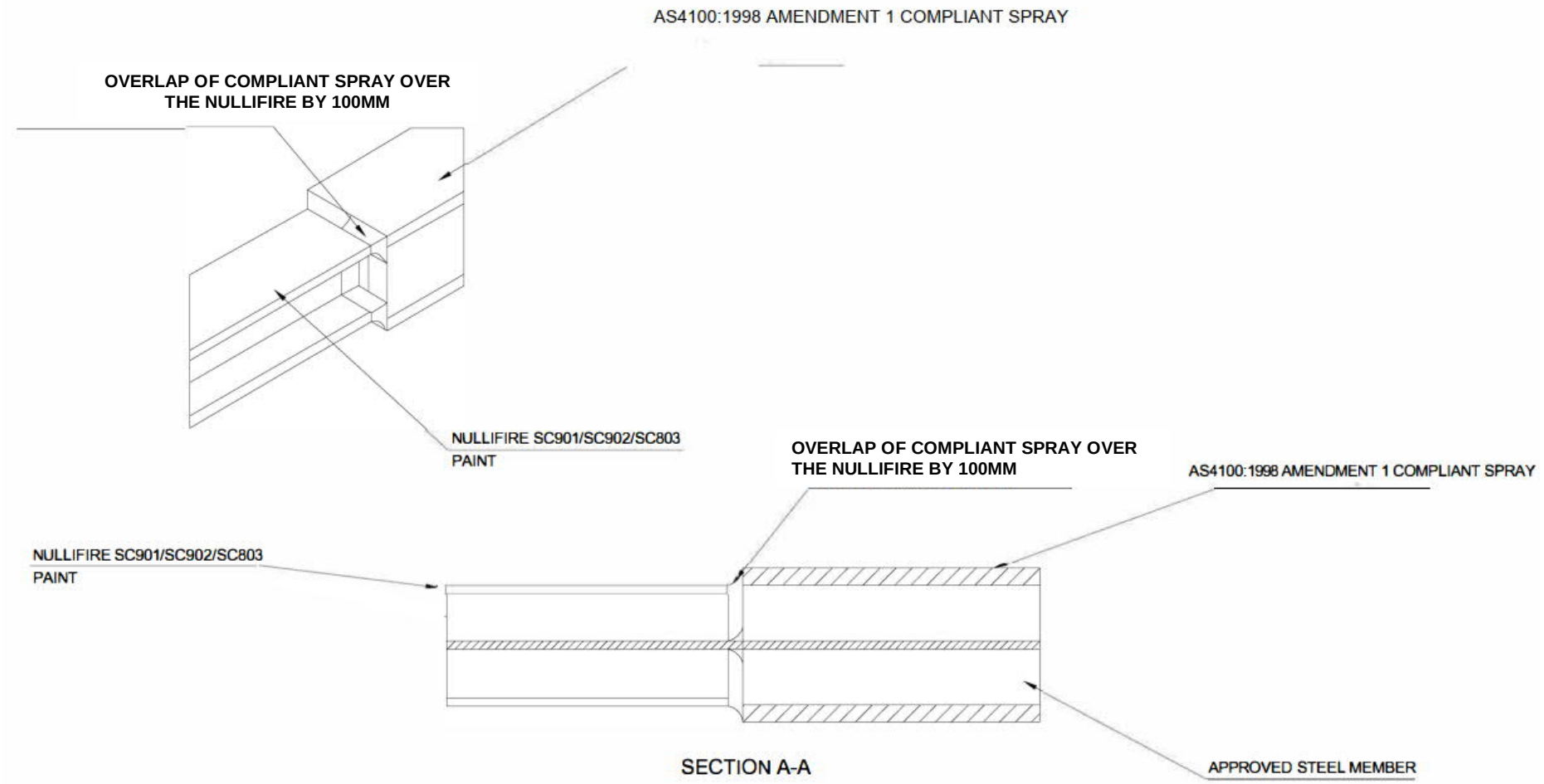

Figure 2 The construction detail when the spray protection system is added next to the Nullifire intumescent coating

5. Assessment of the interface between Nullifire SC803 or SC901/902 coating and fire protection spray or board

5.1 Description of variation

The Nullifire SC803 and SC901/902 have been tested and assessed as structural steel fire protection systems – in accordance with AS 4100:1998 Incorporating Amendment 1 in fire assessment reports FC 11648-001 and FC 11812-001, respectively. As per the referenced fire assessment reports, Nullifire SC803 and SC901/902 are capable of providing PSAs up to 90 and 120 minutes, respectively, for open section beams and columns, and hollow section columns.

It is proposed to protect structural steel beams and columns by a combination of Nullifire SC803 or SC901/902 coating and structural steel protection spray or board. The spray or board that is expected to be used along with Nullifire SC803 or SC901/902 coating at interfaces must have been tested and assessed as a structural steel protection system in accordance with AS 4100:1998 Incorporating Amendment 1. The specific construction details are shown Figure 1 to Figure 2.

This assessment was done to determine the expected performance of the combined structural steel protection system in accordance with the requirements of AS 4100:1998 Incorporating Amendment 1 and AS 1530.4:2014.

5.2 Methodology

The method of assessment used is summarised in Table 4.

Table 4 Method of assessment

Assessment method	
Level of complexity	Simple assessment
Type of assessment	Qualitative

5.3 Assessment

The Nullifire SC803, SC901 and SC902 coatings have been assessed and approved for PSAs up to 120 minutes – when applied in accordance with the manufacturer's instructions and guidance. The coatings have been permitted by the referenced assessment report summarised in Table 2 for open section beams and columns, and hollow section columns.

The spray or board that is expected to be used along with Nullifire intumescent coatings must also have been tested and approved for fire protection of steel elements – in accordance with AS 4100:1998 Incorporating Amendment 1 and applied in accordance with the manufacturer's instructions.

5.3.1 Board protection system is added next to the existing intumescent paint protection system

Figure 1 shows the construction detail when the board protection system is added next to the existing intumescent paint protection system. In the proposed construction, one of the steel members is protected using Nullifire SC803 or SC901/902 coating and the other is protected using an approved structural steel board fire protection system.

As the boards are applied after the application of intumescent paint, it is proposed to overlap the board protection over intumescent paint for at least 100 mm – which is expected to provide additional protection at the interface. As a result, overlapping the two protection systems by 100 mm is expected to provide a safety margin which allows for increased confidence in the proposed detailing. In addition, it is proposed to protect the interface using a compliant fire rated sealant as shown in Figure 1. The sealant fillet size must be same size as the board thickness. The inclusion of the sealant at the interface is expected to eliminate any gaps or anomalies of fire protection at the interface.

The specific fixing methods of the boards and surface preparation before the application of intumescent paint must be adhered to be in line with the referenced tests or assessment reports – to ensure that stickability is maintained for the required PSA.

As a complete system, the PSA of the overall system will be governed by the minimum PSA of Nullifire SC803, SC901/902 coating and board protected structural steel member. Reference should be made to the relevant fire assessment report to determine the required thickness of intumescent paint and board protection.

As such, this report must be used in conjunction with FC 11648-001 or FC 11812-001, and the fire assessment report of the board protection system.

Based on the discussion above, the interface details between Nullifire SC803, SC901/902 coating and board protection system as shown in Figure 1 is not considered to be detrimental to the fire resistance performance of structural steel members.

5.3.2 The spray protection system is added next to the existing intumescent paint protection system

Figure 2 shows the construction detail when the spray protection system is added next to the existing intumescent paint protection system. In the proposed construction, one of the steel members is protected using Nullifire SC803 or SC901/902 coating and the other is protected using an approved structural steel spray fire protection system.

As the spray is applied after the application of Nullifire SC803 or SC901/902 coating, it is proposed to overlap the coating using the spray for a distance not less than 100 mm (see Figure 2). This is expected to eliminate any gaps or inconsistencies of fire protection at the interface.

It is important that the coating and spray are applied correctly at the interface – to be in line with the application process followed in the referenced tests – to ensure that stickability is maintained for the required period of structural adequacy (in line with their own assessment).

The spray protection, which once hardened remains in place, is expected to provide additional protection at the 100 mm interface. As a result, overlapping the two protection systems by 100 mm is expected to provide a safety margin. This allows for increased confidence in the proposed detailing.

As a complete system, the PSA of the overall system will be governed by the minimum PSA of Nullifire SC803 or SC901/902 coating and spray protected structural steel member. Reference should be made to the relevant fire assessment report to determine the required thickness of spray protection. As such, this report must be used in conjunction with FC 11648-001 or FC 11812-001, and the fire assessment report of the spray protection system.

Based on the discussion above, the interface details between Nullifire SC803 or SC901/902 coating and spray protection system as shown in Figure 2 are not considered to be detrimental to the fire resistance performance of structural steel members.

5.4 Conclusion

It is expected that the interface construction details between the Nullifire SC803 or SC901/902 coating and the structural steel fire protection spray or board – as shown in Figure 1 to Figure 2, if applied in accordance with the manufacturers' instructions following the guidelines stipulated in corresponding fire assessment reports – would not be detrimental to the overall fire resistance performance if tested in accordance with AS 1530.4:2014. The overall PSA of the construction will be governed by the minimum PSA of each protected structural steel member.

Relevant fire assessment reports must be referred to determine the required board, spray and intumescent paint protection thicknesses. As such, this report must be used in conjunction with FC 11648-001 or FC 11812-001, and the fire assessment reports of the spray or board systems.

6. Validity

Warringtonfire does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance of the proposed systems expected to be demonstrated on a test in accordance with AS 1530.4:2014 based on the evidence referred to in this report.

This assessment is provided to Tremco Construction Products Group for their own specific purposes. This report may be used as Evidence of Suitability in accordance the requirements of the relevant National Construction Code. Building certifiers and other third parties must determine the suitability of the systems described in this report for a specific installation.

Appendix A Drawings and additional information

Table 5 Details of drawings

Drawing title	Date	Drawn by
The construction detail when a board system is added next to the existing intumescent paint system	27 September 2021	Supplied by Tremco Construction Products Group
The construction detail when a vermiculite system is added next to the existing intumescent paint system	14 September 2021	

Appendix B Summary of supporting test data

B.1 Assessment report – FC 11648-001

Table 6 Information about assessment report

Item	Information about test report
Report sponsor	Nullifire, a division of Tremco Illbruck Coatings Limited
Issuing laboratory	BRANZ New Zealand
Assessment date	The fire assessment was completed on 24 June 2019.
Assessment standards	The assessment was done in accordance with AS 4100:1998 Incorporating Amendment 1 using the testing and assessment methodology of EN 13381-8:2013.
General description of the assessment	The report consists of an assessment of the fire resistance performance of Nullifire SC 803 coating protected open section beams and columns, and hollow section columns. The assessment covers period of structural adequacies of 30, 45, 60 and 90 minutes. It considers a range of critical steel temperatures between 350℃ and 750℃ and section factors between 55 m^{-1} and 335 m^{-1}.

B.2 Assessment report – FC 11812-001

Table 7 Information about assessment report

Item	Information about test report
Report sponsor	Tremco Pty Ltd
Issuing laboratory	BRANZ New Zealand
Assessment date	The fire assessment was completed on 4 June 2020.
Assessment standards	The assessment was done in accordance with AS 4100:1998 Incorporating Amendment 1 using the testing and assessment methodology of EN 13381-8:2013.
General description of the assessment	The report consists of an assessment of the fire resistance performance of Nullifire SC 901/902 coating protected open section beams and columns, and hollow section columns. The assessment covers period of structural adequacies of 30, 45, 60, 90, 105 and 120 minutes. It considers a range of critical steel temperatures between 350℃ and 750℃ and section factors between 50 m^{-1} and 320 m^{-1}.

warringtonfire

Proud to be part of element

Warringtonfire Australia Pty Ltd
ABN 81 050 241 524

Perth

Unit 22, 22 Railway Road
Subiaco WA 6008
Australia
T: +61 8 9382 3844

Canberra

Unit 10, 71 Leichhardt Street
Kingston ACT 2604
Australia
T: +61 2 6260 8488

Melbourne

Level 9, 401 Collins Street
Melbourne VIC 3000
Australia
T: +61 3 9767 1000

Sydney

Suite 802, Level 8, 383 Kent Street
Sydney NSW 2000
Australia
T: +61 2 9211 4333

Brisbane

Suite 6, Level 12, 133 Mary Street
Brisbane QLD 4000
Australia
T: +61 7 3238 1700

Melbourne – NATA accredited laboratory

Unit 2, 409-411 Hammond Road
Dandenong South VIC 3175
Australia
T: +61 3 9767 1000

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