WARRINGTONFIRE
AUSTRALIA
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Product review report

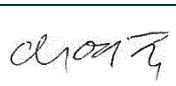
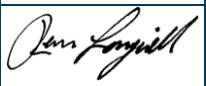
Best practice guideline for Tremco PERLIFOC HP ECO+ applications

Sponsor: Tremco CPG Australia Pty Ltd

Report number: FAS230098 Revision: PRR1.1

Issued date: 22 March 2024 Expiry date: 31 July 2028

Quality management

Version	Date	Information about the report			
PRR1.0	Issue: 19 Jul 2023	Reason for issue	Initial issue		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Edward Kwok	Yomal Dias	Omar Saad
PRR1.1	Issue: 22 Mar 2024	Reason for issue	Report updated to include junction details between PERLIFOC HP ECO+ and other vermicular spray.		
			Prepared by	**Reviewed by**	**Authorised by**
	Expiry: 31 Jul 2028	**Name**	Wesley Lee	Kevin Longwill	Omar Saad
		Signature			

Warringtonfire* Australia Pty Ltd
ABN 81 050 241 524

Executive summary

This report documents the recommended guidelines for best practice in protecting structural steel members with gypsum base mortar, PERLIFOC HP ECO+, in accordance with AS 4100:2020 and AS 1530.4:2014. Specifically, it presents guidelines for best practice for the interface detailing between PERLIFOC HP ECO+ and other structural steel fire protection systems. The mechanism of each fire protection method may be different. It is important to treat the interface between two different steel fire protection systems appropriately.

AS 4100:2020 outlines the requirements for fire protection of structural steel member connections and the interface of the protection between different members. However, it doesn't provide specific guidance related to the proposed details in this report when the fire protection of the steel member is different. As a result, the ASFP Technical Guidance Document (TGD) 8 guidelines for best practice have been adopted for this product review.

PERLIFOC HP ECO+ has been tested and assessed as a structural steel fire protection system in accordance with AS 4100:2020, incorporating Amendment 1. It can provide a period of structural adequacy (PSA) of up to 240 minutes for open and hollow section beams and columns, according to the referenced fire assessment report FC15622-01-3. Similarly, other structural steel fire protection systems that are expected to interface with PERLIFOC HP ECO+ must be tested and assessed by others as structural steel protection systems in accordance with either AS 4100:1998 (R2016) incorporating Amendment 1, AS 4100:2020 or AS 4100:2020 incorporating Amendment 1.

Based on the discussion in section 5 of this report, the proposed construction details of PERLIFOC HP ECO+ protecting structural steel members – if applied in accordance with the manufacturer’s instructions following the guidelines stipulated in the corresponding fire assessment report FC15622-01-3 – would not be detrimental to the overall fire resistance performance – in accordance with AS 1530.4:2014. The overall PSA of the construction will be governed by the minimum PSA of the PERLIFOC HP ECO+ protected structural steel member and the adjacent structural steel member protected with other fire protection systems.

The outcome of this product review is subject to the limitations and requirements described in sections 2, 3 and 6 of this report. The results of this product review report are valid until 31 July 2028.

Contents

1. Introduction

This report documents the recommended guidelines for best practice in protecting structural steel members with PERLIFOC HP ECO+ in accordance with AS 4100:2020[1] and AS 1530.4:2014[2]. Specifically, it presents guidelines for best practice for the interface detailing between PERLIFOC HP ECO+ – a gypsum base mortar – and other structural steel fire protection systems.

This product review was carried out at the request of Tremco CPG Australia Pty Ltd.

The sponsor details are included in Table 1. The documentation that forms the basis for this report is listed in Appendix A.

Table 1 Sponsor details

Sponsor	Address
Tremco CPG Australia Pty Ltd	Unit 12 / 4 Southridge Street Eastern Creek NSW 2766 Australia

2. Declaration

By accepting our fee proposal on 27 February 2024, Tremco CPG Australia Pty Ltd confirmed that:

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

3. Requirements and limitations of this product review

- The scope of this report is limited to the variations to the systems described in section 4.3.
- This report details the methods of construction for junctions between different fire protection systems tested or assessed in accordance with AS 1530:2014 and AS 4100:1998 (R2016) incorporating Amendment 1, AS 4100:2020 or AS 4100:2020 incorporating Amendment 1[3] – when applied to structural steel elements.
- This assessment is applicable for structural steel I/H section and hollow section beams and columns. In addition, it is applicable to re-entrant profile steel sections such as T sections, angles and C sections.
- The overall PSA of the construction is governed by the minimum PSA of the PERLIFOC HP ECO+ protected structural member and the adjacent structural steel member protected with a different type of fire protection system.
- For details where PERLIFOC HP ECO+ meets with other vermiculite spray product, the manufacturer must confirm the chemical compatibility between the two systems. If the manufacturer is unable to confirm the chemical compatibility or the two systems are

[1] Standards Australia, 2020, Steel structures, AS 4100:2020, Standards Australia, NSW.
[2] Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
[3] Standards Australia, 2020, Steel structures, AS 4100:2020 Incorporating Amendment 1, Standards Australia, NSW.

chemically non-compatible, a layer of fire-rated board – which is assessed to have a fire resistance performance equivalent to the intended PERLIFOC HP ECO+ protection – must be installed between the two products to prevent direct contact.

- Relevant fire assessment reports must be referred to in order to determine the required structural steel fire protection thicknesses. As such, this report must be used in conjunction with FC15622-01-3[4], as well as the fire assessment reports of the board system or intumescent paint protection systems.
- The fire protection systems that are expected to be used along with PERLIFOC HP ECO+ at interfaces must have been tested and assessed as a structural steel protection system in accordance with AS 4100:1998 (R2016) incorporating Amendment 1 or AS 4100:2020 incorporating Amendment 1 – by an Accredited Testing Laboratory (ATL).
- Fire-rated sealant used in conjunction with the above-mentioned structural steel fire protections must have an established fire resistance performance as required for the application, tested or assessed by an accredited testing laboratory and must not compromise the PSA achievable using PERLIFOC HP ECO+.
- This report is only valid for the systems reviewed in the referenced assessment report 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 product review. If there are changes to the system, a reassessment will need to be done by an ATL that is accredited to the same nominated standards of this report.
- This report has been prepared using information provided by others. Warringtonfire Australia has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may have been incorporated into this report as a result.
- This report is subject to the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and 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 Description of assessed systems

This report addresses the best practices to be followed for the interface detailing between PERLIFOC HP ECO+ protected structural steel beams and columns, and other structural steel members protected with different fire protection systems.

PERLIFOC HP ECO+ has been tested and assessed as a structural steel fire protection system in accordance with AS 4100:2020, incorporating Amendment 1. According to the referenced fire assessment report FC15622-01-3, PERLIFOC HP ECO+ is capable of providing a Period of Structural Adequacy (PSA) of up to 240 minutes for open and hollow section beams and columns. Similarly, other fire protection systems that are expected to be used along with PERLIFOC HP ECO+ at interfaces must have been tested and assessed as structural steel protection systems in accordance with AS 4100:1998 (R2016) Incorporating Amendment 1[5], AS 4100:2020 or AS 4100:2020 Incorporating Amendment 1.

[4] Branz,14th April 2023, Fire resistance of PERLIFOC HP ECO + structural steel protection in accordance with AS 4100:2020, Inc Amd 1:2021 using the testing and assessment methodology of EN13381-4:2013, Branz, New Zealand.
[5] Standards Australia, 1998, Steel structures, AS 4100:1998 (R2016) Incorporating Amendment 1, Standards Australia, NSW.

4.2 Referenced test data

The product review and the determination of the best practice guideline are based on the results of the fire assessment documented in the report summarised in Table 2. Further details are included in Appendix A.

Table 2 Referenced assessment report

Report number	Test sponsor	Issue date	Testing authority
FC15622-01-3	Tremco CPG Australia	14 April 2023	BRANZ

4.3 Variations to the tested systems

The variations to the assessed system – together with the referenced assessment report – are described in Table 3.

Table 3 Variations to tested systems

Item	Reference assessment report	Description	Variations
Fire protection of structural steel	FC15622-01-3	The referenced assessment report permits the protection of structural steel members using PERLIFOC HP ECO+ for a PSA of up to 240 minutes. Refer to the referenced assessment report for specific limitations and outcomes.	The interface details between structural steel members protected with PERLIFOC HP ECO+ and other fire protection systems are proposed.

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 4100:2020 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 ratio. Based on the test data, AS 4100:2020 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 details

Figure 1 to Figure 6 show the reviewed generic construction details as part of this best practice guideline.

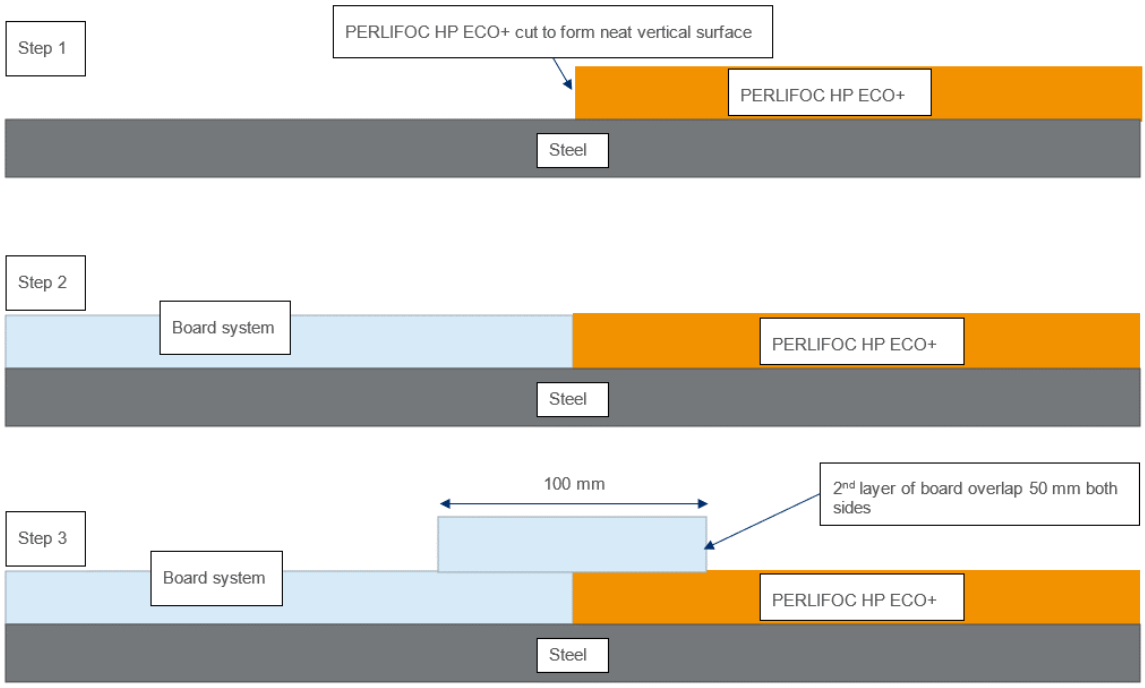


Figure 1 Installing a new board system next to PERLIFOC HP ECO+ protected steel

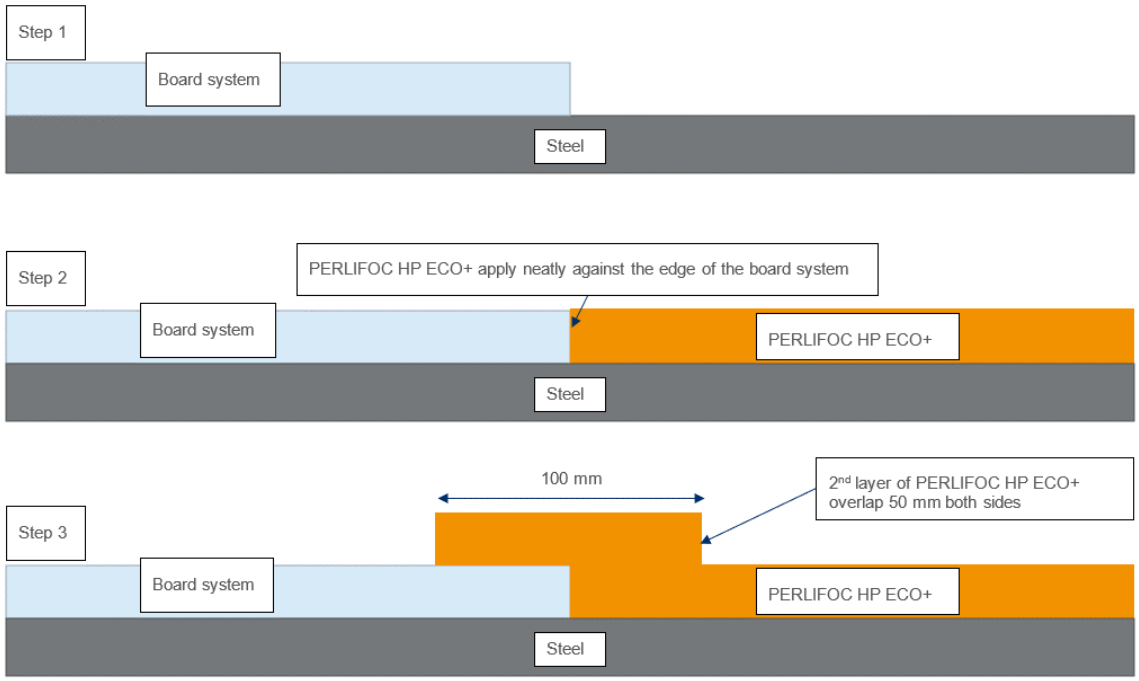


Figure 2 Installing PERLIFOC HP ECO+ next to existing board system protected steel

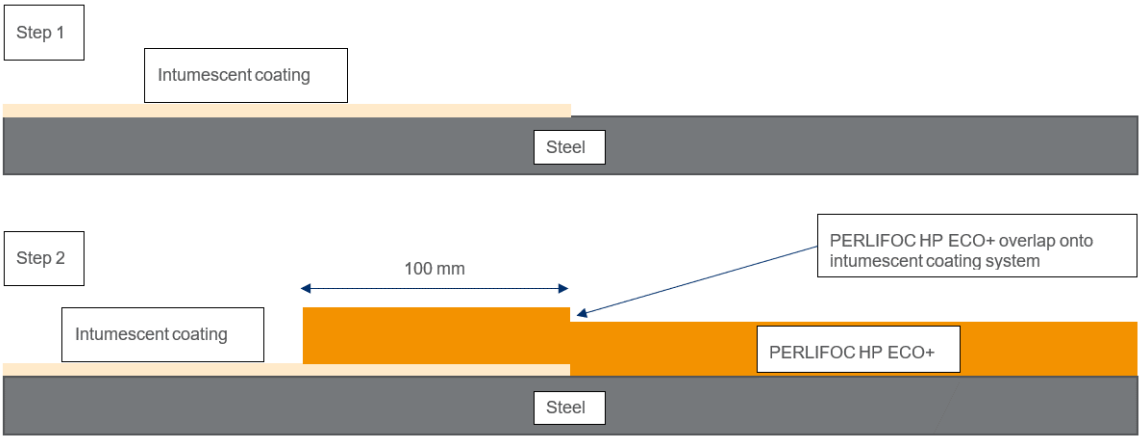


Figure 3 Installing PERLIFOC HP ECO+ next to existing intumescent coated steel

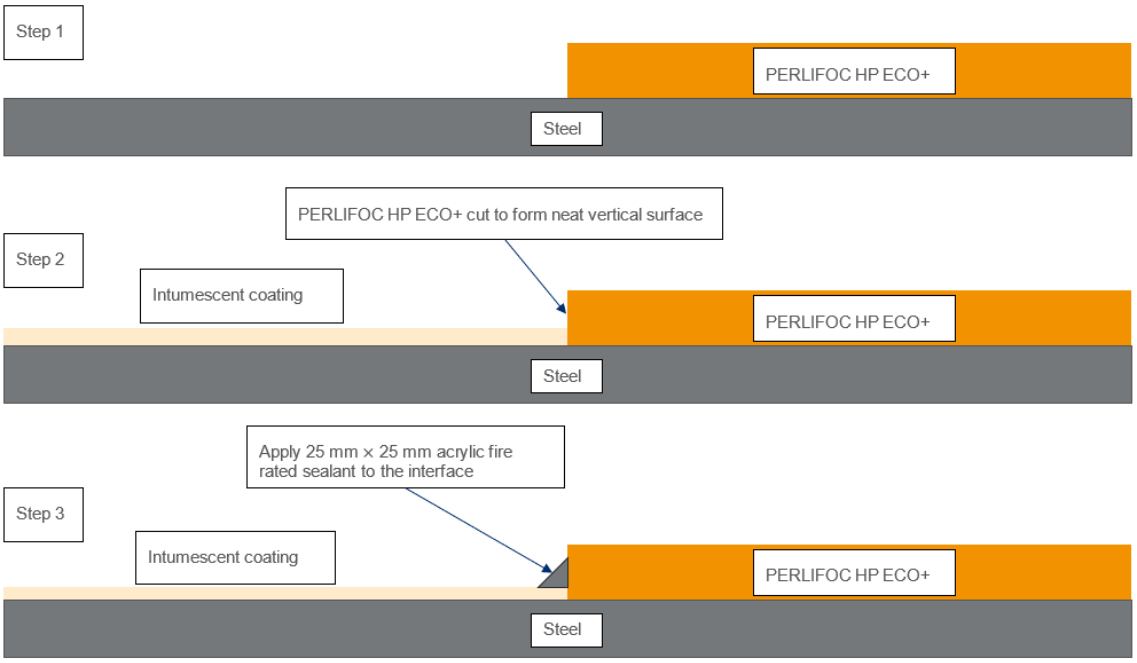


Figure 4 Installing intumescent coating next to existing PERLIFOC HP ECO+ protected steel

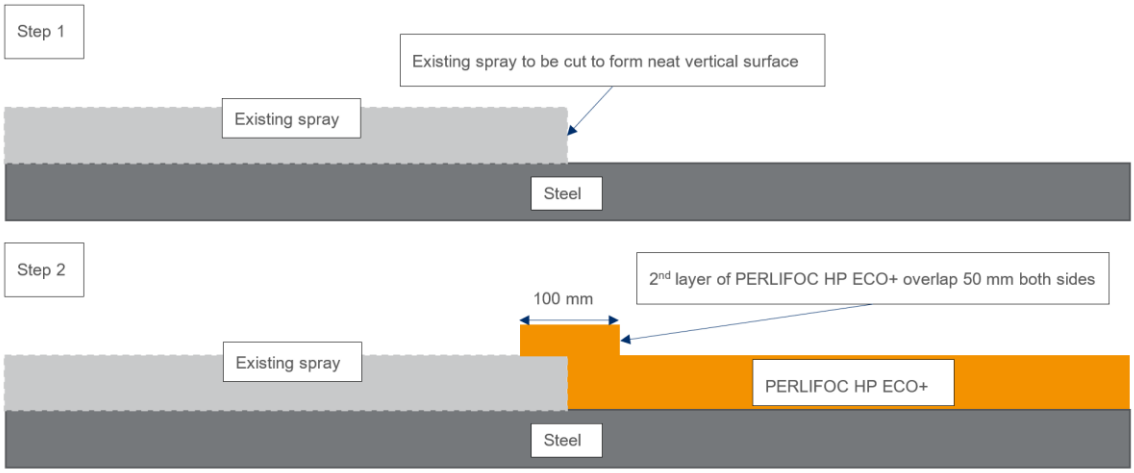


Figure 5 Installing PERLIFOC HP ECO+ next to existing vermiculite spray – with chemical compatibility confirmed by the manufacturer

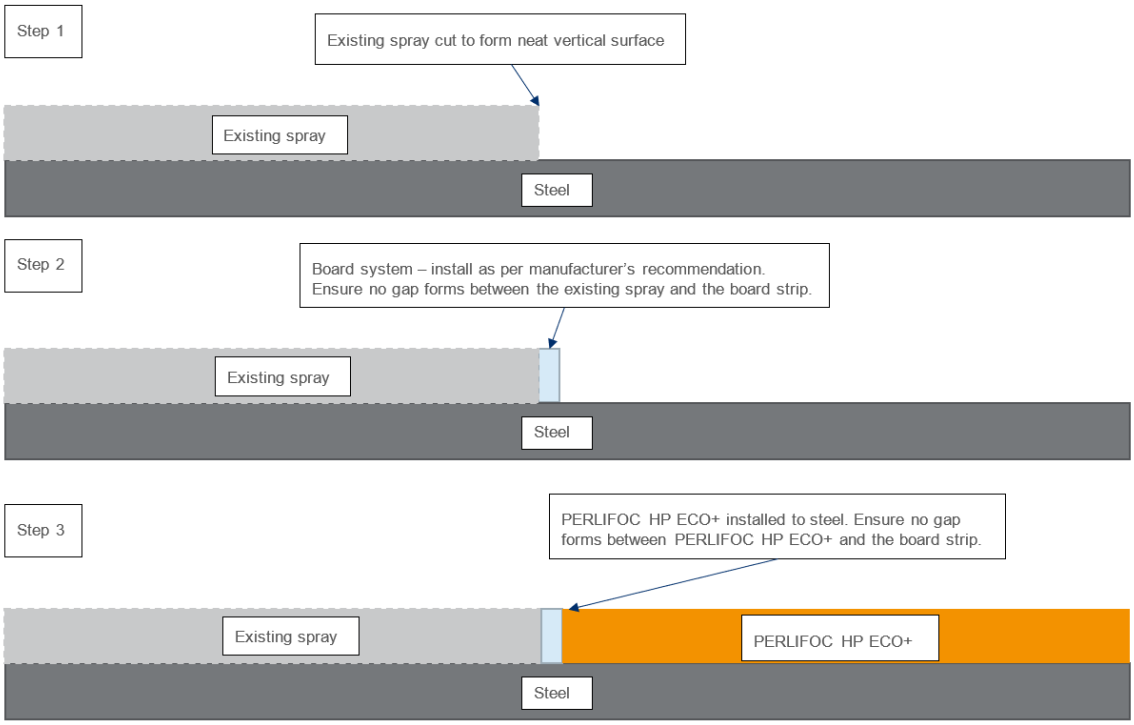


Figure 6 Installing PERLIFOC HP ECO+ next to existing vermiculite spray – without chemical compatibility confirmed by the manufacturer

5. Review of the interface between PERLIFOC HP ECO+ and other fire protection systems

5.1 Description of variation

PERLIFOC HP ECO+ has been tested and assessed as a structural steel fire protection system in accordance with AS 4100:2020 Incorporating Amendment 1. As per the referenced fire assessment report FC15622-01-3, PERLIFOC HP ECO+ is capable of providing PSA of up to 240 minutes for open and hollow section beams and columns. Similarly, other fire protection systems that are expected to be used along with PERLIFOC HP ECO+ at interfaces must have been tested and assessed as structural steel protection systems in accordance with AS 4100:1998 (R2016) Incorporating Amendment 1, AS 4100:2020 or AS 4100:2020 Incorporating Amendment 1.

It is proposed to protect structural steel beams and columns with a combination of PERLIFOC HP ECO+ and other intumescent paint or board system. The proposed construction details are shown in Figure 1 to Figure 6.

This product review was done to determine the expected performance of the system in accordance with the requirements of AS 4100:2020 Incorporating Amendment 1 and AS 1530.4:2014.

5.2 Systems review

5.2.1 General

PERLIFOC HP ECO+ has been assessed and approved for PSAs up to 240 minutes – when applied in accordance with the manufacturer's guidance and in accordance with the baseline product assessment report. Based on the assessment report, PERLIFOC HP ECO+ is applicable to open and hollow section steel beams and columns. There can be instances where PERLIFOC HP ECO+ interacts with another adjacent fire protection system protecting structural steel members. All adjacent structural steel fire protection systems must have been tested and assessed in accordance with AS 4100:2020, Incorporating Amendment 1 or AS 4100:1998 (R2016), Incorporating Amendment 1, and applied in accordance with the manufacturer's guidelines and the product assessment report.

AS 4100:2020 outlines the requirements for fire protection of structural steel member connections and the interface of the protection between different members. However, it doesn't provide specific guidance related to the proposed details in this report when the fire protection of the steel member is different. Despite this, the proposed details are designed to offer fire protection in a continuous and unbroken manner. The details incorporate compatible products that are not expected to interfere with each other's performance. As a result, the ASFP Technical Guidance Document (TGD) 8[6] guidelines for best practice have been adopted.

5.2.2 Installing a board protection system next to already installed PERLIFOC HP ECO+ protected steel

Figure 1 shows the construction detail when the board system is installed next to the existing PERLIFOC HP ECO+ system. In the proposed construction, one of the steel members is protected using PERLIFOC HP ECO+ and the other is protected using an approved structural steel board protection system.

The fixing method/mechanism of PERLIFOC HP ECO+ is different from those of the board system. While the board systems are usually fastened mechanically, PERLIFOC HP ECO+ is retained in place due to its adhesion to the steel substrate. It is important that the fixity of the board system and PERLIFOC HP ECO+ at the interface is detailed appropriately – to be in line with the fixing system used in the referenced tests or product assessment report – to ensure that stickability is maintained for the required period of structural adequacy (in line with their own assessment).

[6] Association for Specialist Fire Protection, 2010, Code of practice for junctions between different fire protection systems when applied to load bearing structural steel elements, TGD 8, Association for Specialist Fire Protection, Hampshire, UK.

TGD 8 provides a code of practice for junctions between different fire protection systems when applied to structural steel elements. The document states that when adding a board system adjacent to a spray system, the existing spray should be cut back to provide a flat edge, the board system should be capped off at the junction and have a suitable overlapping length.

For this scenario, where the board system is installed after the application of PERLIFOC HP ECO+ and the applied PERLIFOC HP ECO+ is hardened, it is proposed to cut back the PERLIFOC HP ECO+ system to provide a flat edge to allow for the neat installation of the board system. An additional layer of 100 mm wide board – with the same thickness as the first layer – is then screw fixed to the existing board system and extended 50 mm onto both the board and PERLIFOC HP ECO+ systems. With this installation, the interface between the board system and PERLIFOC HP ECO+ will be protected by the single layer 100 mm wide (minimum) board strip. This is expected to eliminate any gaps or inconsistencies of fire protection at the interface. The fixing methods / mechanisms of the board systems and PERLIFOC HP ECO+ must be in line with the fixing system used in the referenced tests or as per the product assessment report – to ensure that stickability is maintained for the required period of structural adequacy.

Based on the discussion above, the interface detail between the board system and the PERLIFOC HP ECO+ system, as shown in Figure 1, is not considered to be detrimental to the established fire resistance performance of structural steel members.

5.2.3 Installing PERLIFOC HP ECO+ next to existing board system protected steel

Figure 2 shows the construction detail when PERLIFOC HP ECO+ is applied next to an existing board system. In the proposed construction, one of the steel members is protected using PERLIFOC HP ECO+ and the other is protected using an approved structural steel protected board system.

As per the discussion in section 5.2.2, the fixing methods / mechanism of PERLIFOC HP ECO+ and board systems are different. Thus, it is important that the fixity of the board system and PERLIFOC HP ECO+ at the interface is detailed appropriately – to be in line with the fixing system used in the referenced tests or product assessment report – to ensure that stickability is maintained for the required period of structural adequacy (in line with their own assessment).

For this scenario, where PERLIFOC HP ECO+ is applied after the installation of the board system, it is proposed to overlap the board system with PERLIFOC HP ECO+ for a minimum distance of 50 mm as shown in Figure 2. The PERLIFOC HP ECO+ system, which once hardened remains in place, is expected to provide additional protection at the 100 mm overlapping interface and eliminate any gaps or inconsistencies in fire protection at the interface. As a result, overlapping the two protection systems by 50 mm is expected to provide a safety margin. This allows for increased confidence in the proposed detailing.

Based on the discussion above, the interface details between the board system and the PERLIFOC HP ECO+ system as shown in Figure 2, are not considered to be detrimental to the established fire resistance performance of structural steel members.

5.2.4 Installing PERLIFOC HP ECO+ next to intumescent paint coated steel

Figure 3 shows the construction detail when PERLIFOC HP ECO+ is added next to an existing intumescent paint protection system. In the proposed construction, one of the steel members is protected using PERLIFOC HP ECO+, and the other is protected using an approved structural steel intumescent paint fire protection system.

TGD 8 states that when adding a spray system adjacent to a reactive coating, it is recommended to have the spray overlap the reactive coating by a minimum of 100 mm. In this scenario, where the intumescent coating is applied first, the steel section to be protected with PERLIFOC HP ECO+ must be properly masked prior to the intumescent paint application to prevent any intumescent paint overspray. After the application of intumescent paint, PERLIFOC HP ECO+ is then applied to the proposed steel section and overlapped onto the intumescent coated steel for a minimum of 100 mm. PERLIFOC HP ECO+ must be applied after the intumescent coating settlement period (suggested by the product manufacturer) has passed. This approach is expected to eliminate any gaps or inconsistencies in fire protection at the interface.

Based on the discussion above, the interface detail between intumescent coating and the PERLIFOC HP ECO+ system, as shown in Figure 3, is not considered to be detrimental to the established fire resistance performance of structural steel members.

5.2.5 Installing intumescent coating next to PERLIFOC HP ECO+ protected steel

Figure 4 shows the construction detail when an intumescent coating is applied next to the existing PERLIFOC HP ECO+ system. In the proposed construction, one of the steel members is protected using PERLIFOC HP ECO+ and the other is protected using an approved structural steel intumescent paint fire protection system.

TGD 8 states that when adding a reactive coating next to an existing sprayed system, it is recommended to have a simple butt joint between the two different fire protection systems. In this scenario, where PERLIFOC HP ECO+ is applied first, the proposed intumescent coating protecting structural steel must be properly masked to prevent any PERLIFOC HP ECO+ overspray onto the steel. Once PERLIFOC HP ECO+ is applied and hardened, it is proposed to cut back the PERLIFOC HP ECO+ system to provide a flat edge to allow for neat installation. It is recommended by TGD 8 to apply the intumescent paint after the PERLIFOC HP ECO+ spray is completely hardened. Once the spray is hardened, it is recommended by TGD 8 to mask off the PERLIFOC HP ECO+ spray for intumescent coating application. Once the intumescent coating application is completed, a bead of AS 1530.4:2014 tested acrylic fire-rated sealant – with a size of 25 mm × 25 mm – is applied to the interface between the two structural steel fire protection systems. This is in line with the recommendation for good practise provided in TGD 8, where a butt joint is recommended when applying reactive coating next to an existing sprayed system.

Based on the discussion above, the interface details between intumescent coating and the PERLIFOC HP ECO+ system, as shown in Figure 4, is not considered to be detrimental to the established fire resistance performance of structural steel members.

5.2.6 Installing PERLIFOC HP ECO+ next to existing vermiculite spray

Introduction

Figure 5 and Figure 6 show the construction detail when PERLIFOC HP ECO+ is installed next to the existing vermiculite spray system. In the proposed construction, one of the steel members is protected using an approved vermiculite spray protection system and the other is protected with PERLIFOC HP ECO+.

Different vermiculite spray systems may have different chemical compositions. TGD 8 states that when adding a vermiculite spray system adjacent to another vermiculite spray system chemical compatibility between the two systems must be confirmed. This section provides installation recommendation for both the chemical compatible and incompatible scenarios.

Chemically compatible vermiculite spray

TGD 8 states that once chemical compatibility is established, a tight butt joint between the two systems should be used. In this scenario, where the PERLIFOC HP ECO+ is applied adjacent to the existing vermiculite spray system, it is proposed to cut back the existing vermiculite spray system to provide a flat edge to allow for a tight butt joint between the two systems. After the cutback, PERLIFOC HP ECO+ is then applied to the proposed steel section. Once the layer of PERLIFOC HP

ECO+ is hardened and remains in place, provide additional 100 mm of PERLIFOC HP ECO+ at the interface overlapping 50 mm across both the vermiculite spray system and PERLIFOC HP ECO+. This will eliminate any gaps or inconsistencies in fire protection at the interface – increasing confidence in the proposed detailing.

Based on the discussion above, the interface details between the existing vermiculite spray and the PERLIFOC HP ECO+ system, as shown in Figure 5, are not considered to be detrimental to the established fire resistance performance of structural steel members.

Incompatible or not confirmed chemical compatible vermiculite spray

In case of the chemical compatibility is not confirmed or found to be incompatible, the system as shown in Figure 6 will prevent direct contact between the two vermiculite spray. For this scenario, where PERLIFOC HP ECO+ is selected to be installed adjacent to the existing vermiculite spray system, the existing vermiculite spray system is cut back to provide a flat edge to allow for a neat installation. After the cutback, insert fire-rated plasterboard system as per manufacturer's recommendation as shown in Figure 6. The board system must be proofed to comply with AS 4100:2020 Incorporating Amendment 1. The purpose of the inclusion of the board is to prevent direct contact between PERLIFOC HP ECO+ and the incompatible existing vermiculite spray product. The board must be proofed capable of achieving similar or better FRL compared to the adjacent PERLIFOC HP ECO+ and vermiculite spray – to prevent the forming of weak points. existing vermiculite spray must be properly masked prior to the PERLIFOC HP ECO+ application to prevent any overspray onto the existing vermiculite spray system.

Note: As per the discussion in section 5.2.2, the fixing methods / mechanism of PERLIFOC HP ECO+, board systems and vermiculite spray systems are different. Thus, it is important that the fixity of the board system, PERLIFOC HP ECO+ and vermiculite spray system at the interface is detailed appropriately – to be in line with the fixing system used in the referenced tests or product assessment report – to ensure that stickability is maintained for the required period of structural adequacy (in line with their own assessment).

As per the above installation, the two incompatible products are separated by fire-rated board system, and the interface between the board and the two protection systems are tightly installed to prevent any gaps forming at the interface. It is therefore considered that the fire resistance performance of the existing vermiculite spray and PERLIFOC HP ECO+ would not be deteriorated.

5.3 Review outcome

It is expected that the interface construction details between the PERLIFOC HP ECO+ system and other structural steel fire protections – as shown in Figure 1 to Figure 6 – would not be detrimental to the overall fire resistance performance in accordance with AS 1530.4:2014. The structural steel fire protection systems must be applied in accordance with the manufacturers' instructions, following the guidelines stipulated in the corresponding fire assessment reports. The overall PSA of the construction will be governed by the minimum PSA of PERLIFOC HP ECO+, vermiculite spray, board system and intumescent paint protected structural steel members.

Relevant fire assessment reports must be referred to in order to determine the required structural steel fire protection thicknesses. As such, this report must be used in conjunction with FC15622-01-3, as well as the fire assessment reports of the board system or intumescent paint protection systems.

6. Validity

This report is prepared for Tremco CPG Australia Pty Ltd and focuses on the interface detailing between PERLIFOC HP ECO+ and other structural steel fire protection systems that comply with the referenced assessment reports, standards, and guidelines mentioned in this report. It is essential to note that any modifications, changes, or amendments to the referenced assessment report, standard, or guidelines may potentially affect the validity of the findings presented in this report. In such cases, these changes should be promptly communicated to Warringtonfire Australia to assess their impact on the outcomes outlined in this review.

Appendix A Drawings and additional information

A.1 Assessment report – FC15622-01-3

Table 4 Information about the report

Item	Information about the report
Report sponsor	Tremco CPG Australia
Issuing laboratory	BRANZ, 1222 Moonshine Road, RD1, Porirua 5381, Private Bag 50 908, Porirua 5240, New Zealand.
Issued date	The fire assessment report was issued on 14 April 2023.
Assessment standards	The assessment was done in accordance with AS 4100:2020 Incorporating Amendment 1.
General description of assessment	The report provides assessment of structural steel members using PERLIFOC HP ECO+ for I and H-section beams, columns and hollow sections depending on the size of the steel section and thickness of coating in accordance with AS 4100:2020 Incorporating Amendment 1. The assessment covers periods of structural adequacy up to 240 minutes, with a range of limiting steel temperatures between 350 °C and 750 °C and section factor between 68 m^{-1} and 476 m^{-1}.