



Fire assessment report

Fire resistance performance of steel framed
plasterboard lined walls additionally cladded with
Carter Holt Harvey SHADOWclad and ECOply cladding




Client: Carter Holt Harvey Plywood Pty Ltd

Product: Walls lined with fire rated plasterboard and SHADOWclad or ECOply cladding

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Amendment schedule

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	Expiry: 30/11/2019	Name	D. Nicholson	K.G. Nicholls	
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			Prepared by	Reviewed by	Approved by
	Expiry: 31/10/2024	Name	Yomal Dias	Omar Saad	Omar Saad
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Exova Warringtonfire rebranded to Warringtonfire on 1 December 2018. Apart from the change to our brand name, no other changes have occurred. The introduction of our new brand name does not affect the validity of existing documents previously issued by us.

Executive summary

This report presents an assessment of the fire resistance performance of steel framed walls lined with 13mm and 16mm thick plasterboards, additionally cladded with Carter Holt Harvey (CHH) SHADOWclad and ECOply cladding, if tested in accordance with AS 1530.4:2014¹.

The assessment conducted in Section 5 of this report found that the tested systems described in Section 3.2, if varied as in Section 3.3, and tested in accordance with the test method described in Section 3.4, would likely achieve the results shown in Table 1.

Table 1 Variations and assessment outcome

Product	Reference test ²	Variation	FRL
Steel framed, 13mm and 16mm fire-rated plasterboard lined wall (underlying system).	EWFA 2479502	Additional cladding of CHH SHADOWclad and ECOply boards onto the underlying system.	The addition of SHADOWclad or ECOply cladding to a tested plasterboard clad wall system having an FRL of 30/30/30, 60/60/60 or 90/90/90 is likely not to have any detrimental effect on the performance of the underlying wall system, if tested in accordance with AS 1530.4:2014.
	BWA 2314600		
	EWFA 2815100.1		

The variations and outcome of this assessment are subject to the limitations and requirements described in Sections 2, 4 and 6 of this report. The results of this report are valid until 31 October 2024.

¹ Standards Australia (2014) Methods for fire tests on building materials, components and structures Fire-resistance tests for elements of construction, AS 1530.4:2014

² The tests were sponsored by Boral Plasterboard who have given permission for their use in this assessment report

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1. Introduction

This report presents an assessment of the fire resistance performance of steel framed walls lined with 13mm and 16mm thick plasterboards, additionally cladded with Carter Holt Harvey (CHH) SHADOWclad and ECOply cladding, if tested in accordance with AS 1530.4:2014. This assessment was carried out at the request of Carter Holt Harvey Plywood Pty Ltd. The sponsor details are included in Table 2.

Table 2 Sponsor details

Client	Address
Carter Holt Harvey Plywood Pty Ltd	22 Prospect Street Box Hill VIC 3128 Australia

2. Framework for the assessment

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

No specific framework, methodology, standard or guidance documents exists in Australia for doing these assessments. Therefore, we have followed the Guide to Undertaking Assessments In Lieu of Fire Tests prepared by the Passive Fire Protection Federation (PFPF) in the UK³.

This guide provides a framework to undertake 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*
- *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.

2.1 Declaration

The guide to undertaking assessments in lieu of fire tests prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal dated 20 May 2019, Carter Holt Harvey Plywood Pty Ltd 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 Guide to Undertaking Assessments In Lieu of Fire Test - The Passive Fire Protection Federation (PFPF), June 2000, UK.

3. Description of the specimen and variations

3.1 System description

The underlying system comprises of a steel frame lined with 13mm and 16mm fire rated plasterboards on both sides of the wall. This underlying system shall have been assigned with an FRL of 30/30/30, 60/60/60 or 90/90/90 either through testing or assessment by others.

The proposed variation is the addition of SHADOWclad or ECOply boards to the face of the underlying wall system using steel or timber battens.

3.2 Referenced test data

The assessment of the variation to the tested system and the determination of the likely performance is based on the results of the fire tests documented in the reports summarised in Table 3. Further details of the tested system are described in Appendix A.

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
EWFA 2815100.1	Boral Plasterboard	13 February 2013	Exova Warringtonfire Aus Pty Ltd
EWFA 2479502	Boral Plasterboard	7 July 2010	Exova Warringtonfire Aus Pty Ltd
BWA 2314600	Boral Plasterboard	27 November 2008	Bodycote Warringtonfire (Aus) Lty Ltd

A comparison between the guidelines specified AS 1530.4:2005 and AS 1530.4:2014, in the context of the tests referenced in Table 3, is provided in Appendix B.

3.3 Variations to tested system

An identical system has not been subject to a standard fire test. We have therefore assessed the system using baseline test information for similar systems. The variations to the tested systems, together with the referenced baseline standard fire tests, are described in Table 4.

Table 4 Variation to tested systems

Item	Reference test	Description	Variations
Exposed or unexposed side cladding	EWFA 2815100.1, EWFA 2479502, BWA 2314600	The tested walls consisted of different configurations of fire rated plasterboard cladding.	SHADOWclad or ECOply boards are cladded onto the tested systems which already have plasterboard cladding

3.4 Purpose of the test

AS 1530.4:2014 sets out the methods for conducting fire tests on building materials, components and structures. Specifically, Section 2 of this standard contains the general requirements for these tests. Section 3 addresses the fire resistance testing of walls.

3.5 Schedule of components

Table 5 outlines the schedule of components of the assessed system.

Table 5 Schedule of components of assessed system

Item	Description	
1	Name	Wall
	Material	Steel or timber framed wall clad with plasterboard
	Specification	This underlying wall system shall be tested or assessed by others to achieve the required FRL of 30/30/30, 60/60/60 or 90/90/90
	Installation	Installed as per tested
2	Name	Timber Cladding option 1
	Material	SHADOWclad, a profiled Radiata pine Plywood cladding
	Size	Thickness: 12mm
	Installation	Installed as an external cladding directly to battens or to wall framing and in compliance with AS/NZS 2269:2008 ⁴
3	Name	Timber Cladding option 2
	Material	ECOply a profiled Radiata pine Plywood cladding
	Size	Thickness: 7mm to 25mm
	Installation	Installed as an external cladding directly to battens or to wall framing and in compliance with AS/NZS 2269:2008
4	Name	SHADOWclad Fixing or ECOply Fixing
	Product	As recommended by CHH
	Installation	Fixed to a batten or directly to frame
5	Name	Batten
	Material	Steel or timber
	Installation	Fixed directly to stud
6	Name	Batten Fixing
	Product	As recommended by CHH and to meet project structural requirements
	Installation	Through plasterboard directly to wall framing

The sectional views of the proposed system, prepared by Warringtonfire Australia, are shown in Figure 1 and Figure 2.

⁴ Standards Australia (2008): Plywood–Structural, Part 0: Specifications. AS/NZS 2269:2008. Standards Australia, Sydney

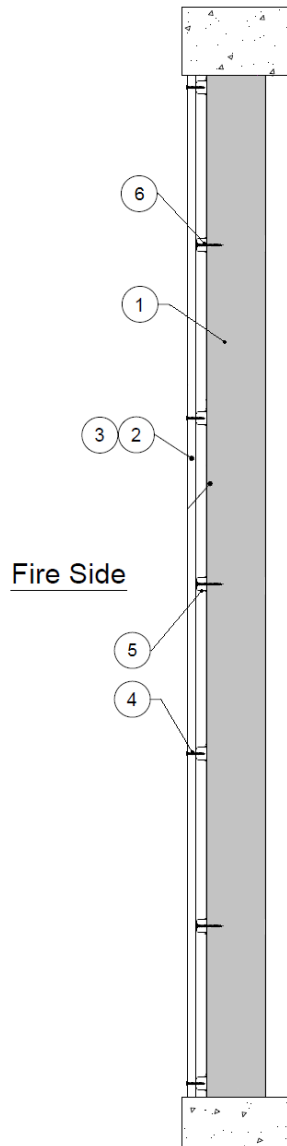


Figure 1 Vertical section of SHADOWclad or ECOply with plasterboard

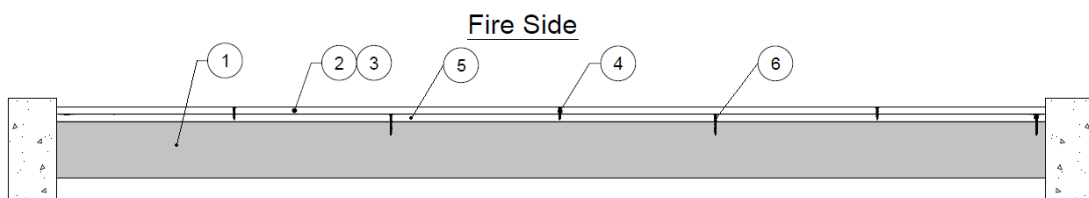


Figure 2 Horizontal section of SHADOWclad or ECOply with plasterboard

4. Scope, objective and assumptions

4.1 Scope and objective

- The scope of this report is limited to an assessment of the variations to the tested systems described in Section 3.2.
- This report details the methods of construction, test conditions and assessed results that would have been expected if the specific elements of construction described here had been tested in accordance with AS 1530.4:2014.
- The results of this assessment are applicable to walls exposed to fire from either side.
- This report is only valid for the assessed system. 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 be needed to verify consistency with the assessment in this report.
- The data, methodologies, calculations and conclusions documented in this report specifically relate to the assessed system and must not be used for any other purpose.
- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/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.

5. Assessment 1 – Steel framed, plasterboard lined wall with additional SHADOWclad and ECOply cladding

5.1 Description of variation

The tested walls were all cladded with fire rated plasterboards on either side as shown in Figure 1 and Figure 2. The proposed variation is to add additional SHADOWclad and ECOply cladding onto these plasterboard lined walls. This assessment was undertaken to determine the likely performance of the proposed system inclusive of this variation only. All other variables are kept constant. The effect of these variables on the likely fire resistance performance of the proposed construction is outside the scope of this assessment.

5.2 Methodology

The approach and method of assessment used for this assessment is summarised in Table 6.

Table 6 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative and comparative

5.3 Assessment

The underlying wall construction of the proposed system is required to meet the FRL requirements of 30/30/30, 60/60/60 or 90/90/90. The tested systems summarised in Appendix A are examples of such systems that could potentially be used as a compliant underlying wall construction for the proposed system.

It is likely that the addition of either SHADOWclad or ECOply cladding to the underlying plasterboard lined wall will provide an additional layer of protection against fire. This is likely to retard the progression of heat across the wall marginally, resulting in lower stud and ambient surface temperatures. Furthermore, the reduction of the temperature gradient across the stud is also likely to reduce thermal bowing/ lateral deflection of the wall and reduce the possibility of the formation of cracks and gaps in the plasterboard lining that lead to the passage of smoke and hot gasses.

The cladding material is a plywood product, and it is expected to burn freely when exposed to the furnace. The remaining wall will be exposed to the burning cladding. However, this exposure is considered to be less severe than the direct exposure to the furnace which is based on the burning of cellulosic materials.

As it is understood that the plywood product will burn and fall off in a test scenario, the combustion process will add energy in the form of heat realised from the cladding. While this could be misunderstood for a more onerous condition, in reality, the furnace thermocouples would refer the increased energy and the furnace control will work to adjust the total energy or temperature to follow the standard furnace temperature curve.

The cladding material is also relatively thin and likely to fall-off soon after burning commences. The underlying plasterboard system will only be directly exposed to the high temperatures of the furnace following such fall-off. Therefore, the addition of SHADOWclad and ECOply cladding is likely to reduce the duration of direct exposure of the underlying construction to fire.

It is considered that the provision of battens to fix the additional cladding onto the wall, using screws that penetrate through the plasterboards and into framing members, mitigates any risk of the underlying plasterboards being damaged as the external cladding falls away.

5.4 Conclusion

Based on the above discussion, it is considered that the addition of SHADOWclad or ECOply cladding to a tested plasterboard lined wall system having an FRL of 30/30/30, 60/60/60 or 90/90/90 will not likely have any detrimental effect on the performance of the underlying wall system, if tested in accordance with AS 1530.4:2014.

6. Validity

Warringtonfire Australia 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 likely 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 the Carter Holt Harvey Plywood Pty Ltd for its own purposes and we cannot express an opinion on whether it will be accepted by building certifiers or any other third parties for any purpose.

Appendix A Summary of supporting test data

A.1 Test report – EWFA 2479502

Table 7 Information relating to test report

Item	Information relating to test report
Report sponsor	Boral Plasterboard, 676 Lorimer Street, Port Melbourne, Victoria 3207
Test laboratory	Exova Warringtonfire Aus Pty Ltd Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was conducted on 07 July 2010
Test standards	The test was conducted in accordance with AS 1530.4:2005.
Variation to test standards	<ol style="list-style-type: none"> The size of the specimen was 1200 × 1200mm rather than 3m × 3m required by the standard. The unexposed face instrumentation was general accordance with the standard only. The specimen was restrained all edges. There were no joints in the cladding to the exposed and unexposed faces. The furnace pressure was below the pressure stated in the standard for the period to 54 minutes, averaging 1Pa. The specimen in this period is largely imperforate; therefore, it is unlikely this low pressure affected the outcome of the test.
General description of tested specimen	The test assembly comprised a nominal 1200mm wide × 1200 mm high × 78 mm thick non-load-bearing plasterboard lined wall system. The wall system was constructed with one layer of 13mm thick Boral FireSTOP plasterboard lined on both exposed and unexposed sides and fixed to 52mm steel studs spaced at nominal 300mm centres and a 52mm timber stud at nominal 300mm centre as well. Thermocouples were embedded in the timber to determine the char factor.

The test specimen achieved the results shown in Table 8.

Table 8 Results summary of test report EWFA 2479502

Observation	Result
Linings on each side	1 × 13mm
Depth of stud	52mm
Time for fall off or large gap formation of the fire side sheets	47 minutes
Maximum temperature on non-fire side of exposed sheet	581°C
Time for non-fire side average to exceed 140°C rise	66 minutes
Time for non-fire side maximum to exceed 180°C rise	61 minutes

Additional remarks:

- The test was terminated at 168 min.
- The ambient temperature was 15 °C.
- The performance is summarised as below.
 - Structural adequacy: Not applicable
 - Integrity: Failure at 168 minutes (Through gap observed approximately 40mm along the top edge where the specimen had moved away from the furnace)
 - Insulation: Failure at 61 minutes (The temperature recorded by thermocouple located at the centre of the specimen exceed initial temperature by 180K)

A.2 Test report – BWA 2314600

Table 9 Information relating to test report

Item	Information relating to test report
Report sponsor	Boral Plasterboard Systems Group, 676 Lorimer Street, Port Melbourne, Victoria 3207
Test laboratory	Bodycote Warringtonfire (Aus) Pty Ltd Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was conducted on 27 November 2008
Test standards	The test was conducted in accordance with AS 1530.4:2005.
Variation to test standards	1. The size of the specimen was 1200 × 1200mm rather than 3m × 3m required by the standard.
General description of tested specimen	The test specimen was a 1200 × 1200 mm plasterboard wall system incorporating a 51 mm steel and timber stud lined with one layer of 16 mm hick Boral Firestop™ on either side.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2005.

The test specimen achieved the results shown in Table 10

Table 10 Results summary of test report BWA 2314600

Time (min)	Observation
80	Time for 140 °C rise in average unexposed surface area temperature
84	Time for 180 °C rise in individual unexposed surface area temperature
56	Time for exposed face flange of steel stud to reach 450 °C
36	Time to reach 300 °C on timber stud and plasterboard interface temperature on the exposed side
66	Time to reach 300 °C on timber stud 10 mm away from the exposed surface
130	Time for exposed face flange of steel stud to reach 750 °C

Additional remarks:

1. The test was terminated at 133 min.
2. Char depth at 60 min based on depth of 300 °C isotherm - 7.8 mm.

A.3 Test report – EWFA 2815100.1

Table 11 Information relating to test report

Item	Information relating to test report
Report sponsor	Boral Plasterboard, 676 Lorimer Street, Port Melbourne, Victoria 3207
Test laboratory	Exova Warringtonfire Aus Pty Ltd Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was conducted on 13 February 2013
Test standards	The test was conducted in accordance with AS1530.4-2005.
Variation to test standards	None
General description of tested specimen	The test assembly comprised a nominal 3000mm wide × 3000 mm high × 128 mm thick non-load-bearing plasterboard lined wall system. The wall system was constructed with two layers of 13mm thick Boral FireSTOP® plasterboard lined on both exposed and unexposed sides and fixed to 76mm steel and timber studs spaced at nominal 600mm centres. Thermocouples were embedded in the timber to determine the char factor.

The test specimen achieved the results shown in Table 12.

Table 12 Results summary of test report

Observation	Time (min)
Time for 140 °C rise in average unexposed surface area temperature	-
Time for 180 °C rise in individual unexposed surface area temperature	-
Fall-off of the outer layer on the exposed side	46
Fall-off of the inner layer on the expose side	96

Additional remarks:

1. The test was terminated at 130 min.
2. The performance is summarised as below
 - a. Structural adequacy: Not applicable
 - b. Integrity: No failure at 130 min
 - c. Insulation: No failure at 130 min
3. Maximum temperature of non-fire side of exposed sheet at 120 min was 706 °C.
4. Char depth at 60 min based on depth of 300 °C isotherm - 0 mm.
5. Char depth at 60 min based on depth of 300 °C isotherm – 8.3 mm.

Appendix B Relevance of AS 1530.4:2005 test data with respect to AS 1530.4:2014

B.1 General

The fire resistance tests EWFA 2479502, BWA 2314600 and EWFA 2815100.1 were conducted in accordance with AS 1530.4:2005, which is different from AS 1530.4:2014. The effect these differences have on fire resistance performance of the referenced test specimens is discussed below.

B.2 Discussion

B.2.1 Temperature

The furnace heating regime in fire resistance tests conducted in accordance with AS 1530.4:2014 follows a similar trend to that in AS 1530.4:2005.

The specified specimen heating rate in AS 1530.4:2005 is given by

$$T_t - T_0 = 345 \log(8t + 1) + 20$$

Where;

T_t = furnace temperature at time t , in degrees Celsius

T_0 = initial furnace temperature, in degrees Celsius, such that

t = the time into the test, measured in minutes from the ignition of the furnace

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and AS 1530.4:2005 are not appreciably different.

B.2.2 Furnace pressure

The furnace pressure conditions in AS 1530.4:2005 and AS 1530.4:2014 are not appreciably different. The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and AS 1530.4:2005 are also not appreciably different.

B.2.3 Performance criteria

AS 1530.4:2014 specifies the following performance criteria for building materials and structures:

- Structural Adequacy
- Integrity
- Insulation.

Structural adequacy

Failure due to structural inadequacy is deemed to have occurred either upon the collapse of the test specimen or when certain limiting threshold values with respect to the axial contraction and the rate of axial contraction are exceeded.

These conditions are defined similarly in both AS 1530.4:2005 and AS 1530.4:2014.

Integrity

AS 1530.4:2014 stipulates in addition to the 20mm thick × 100mm × 100mm cotton pads additional cotton pads shall be provided with a reduced 30mm × 30mm × 20mm with additional wire frame holder shall be used to determine integrity failure.

Apart from the above variation, the failure criteria for integrity in AS 1530.4:2014 and AS 1530.4:2005 are not appreciably different.

Insulation

The positions of thermocouples and failure criteria for insulation in AS 1530.4:2014 and AS 1530.4:2005 are not appreciably different.

B.2.4 Application of referenced test data to AS1530.4:2014

There is a difference in cotton pad size between standards, however it is confirmed that the variation does not affect the integrity performance of the tested systems in the referenced tests for at least 120 minutes.

Based on the above, discussion and in the absence of any foreseeable integrity and insulation risk, it is considered that the results relating to the performance of the specimens tested in EWFA 2479502, BWA 2314600 and EWFA 2815100.1 can be used to assess their performance in accordance with AS 1530.4:2014.