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Fire assessment report

External framed wall system in accordance with AS 1530.8.1:2007

Sponsor: NRG Building Systems

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Quality management

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			Prepared by	**Reviewed by**	**Authorised by**
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		Name	K. Nicholls	M. Kamal	NA
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		Signature			

Executive summary

This report documents the findings of the assessment undertaken to determine the expected bushfire attack level (BAL) rating of a framed wall system as appropriate for external walls – in accordance with AS 1530.8.1:2007.

The analysis in section 5 of this report found that the proposed system, together with the described variation, are expected to achieve the Bushfire Attack Level (BAL) rating as shown in Table 1, in accordance with AS 1530.8.1:2007.

Table 1 Variations and assessment outcome

Reference test	Description	Variations	BAL rating
EWFA 2581501.2	The test assembly consisted of a nominal 3000 mm wide × 3000 mm long × 211 mm thick wall system. The wall system consisted of two 90 mm × 45 mm timber stud frames incorporating an 800 mm × 800 mm timber reveal window. The unexposed side was faced with 10 mm Gyprock plasterboard. The exposed face consisted of 75 mm NRG Greenboard™ foam cladding onto which a 10 mm thick ROCKCOTE PM100 QRender Pre-Blended Cement Render and Mesh, ROCKCOTE Sandcote Pre-coloured Acrylic Coating and ROCKCOTE Armor Flex paint was applied.	• The render to be NRG Polymer Modified Render instead of ROCKCOTE QRender PM100 as tested. The thickness is to remain unchanged and include grooves in the Greenboard™. The fibreglass mesh must remain as tested. • The 1 mm texture finish to be NRG Sand Medium or other similar 1 mm acrylic texture coating instead of ROCKCOTE Sandcote as tested. • The final acrylic paint coating to be NRG Shieldcoat instead of ROCKCOTE Armour Flex. • The timber framing to be 90 mm × 35 mm or 70 mm × 35 mm instead of the tested 90 mm × 45 mm. • Wall framing to be optionally light gauge steel (up to 2 mm BMT) instead of timber.	BAL A – 29

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 31 May 2027.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the expected bushfire attack level (BAL) rating of a framed wall system as appropriate for external walls – in accordance with AS 1530.8.1:2007[1].

This assessment was carried out at the request of NRG Building Systems. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
NRG Building Systems	32-38 Drover Drive West Burleigh 4220, QLD 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 2021[2].

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 bushfire attack level (BAL) rating if the elements were to be tested in accordance with AS 1530.8.1:2007.

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.

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 9 May 2022, NRG Building Systems confirmed that:

[1] Standards Australia, 2007, Methods for fire tests on building materials, components and structures – Part 8.1: Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources, AS 1530.8.1:2007, Standards Australia, NSW.

[2] Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

- 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 were tested in accordance with AS 1530.8.1:2007.
- The BAL rating is applicable to only exposure from outside of the wall system.
- 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 Accredited Testing Laboratory (ATL) that is accredited to the same nominated standards of this report.
- 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 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.
- 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, 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 System description

The test assembly consisted of a nominal 3000 mm wide × 3000 mm long × 211 mm thick wall system. The wall system consisted of two 90 mm × 45 mm timber stud frames with the central frame offset 250 mm back, incorporating an 800 mm × 800 mm timber reveal window. The unexposed side was faced with 10 mm Gyprock plasterboard. The exposed face consisted of 75 mm NRG Greenboard™ foam cladding onto which a 10 mm thick ROCKCOTE PM100 QRender Pre-Blended Cement Render and Mesh, ROCKCOTE Sandcote Pre-coloured Acrylic Coating and ROCKCOTE Armor Flex paint was applied.

The specimen was asymmetrical, with the exposed side of the wall coated with render and plasterboard on the unexposed side. The render thickness of the specimen includes the grooves in the board.

4.2 Referenced test data

The assessment of the variations to the tested system and the determination of the expected performance is based on the results of the fire test documented in the report summarised in Table 3. Further details of the tested system are included in Appendix A.

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
EWFA 2581501.2	NRG Building systems and Rockcote Enterprises Pty Ltd	31 May 2011	Warringtonfire, Australia (formerly T/A Exova Warringtonfire)

4.3 Variations to the tested system

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

Table 4 Variation to tested system

Reference test	Description	Variations
EWFA 2581501.2	The test assembly consisted of a nominal 3000 mm wide × 3000 mm long × 211 mm thick wall system. The wall system consisted of two 90 mm × 45 mm timber stud frames incorporating an 800 mm × 800 mm timber reveal window. The unexposed side was faced with 10 mm Gyprock plasterboard. The exposed face consisted of 75 mm NRG Greenboard™ foam cladding onto which a 10 mm thick ROCKCOTE PM100 QRender Pre-Blended Cement Render and Mesh, ROCKCOTE Sandcote Pre-coloured Acrylic Coating and ROCKCOTE Armor Flex paint was applied.	• The render to be NRG Polymer Modified Render instead of ROCKCOTE QRender PM100 as tested. The thickness is to remain unchanged and include grooves in the Greenboard™. The fibreglass mesh must remain as tested. • The 1 mm texture finish to be NRG Sand Medium or other similar 1 mm acrylic texture coating instead of ROCKCOTE Sandcote as tested. • The final acrylic paint coating to be NRG Shieldcoat instead of ROCKCOTE Armour Flex. • The timber framing to be 90 mm × 35 mm or 70 mm × 35 mm instead of the tested 90 mm × 45 mm. • Wall framing to be optionally light gauge steel (up to 2 mm BMT) instead of timber.

5. Assessment of NRG framed external wall system

5.1 Description of variation

The proposed system is as per the NRG external framed wall system tested in EWFA 2581501.2 with the variations listed in Table 4 in section 4.3.

This assessment was done to determine the expected BAL performance of the framed wall system based on the referenced test data described in Table 3.

5.2 Methodology

The method of assessment used is summarised in Table 5.

Table 5 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
Type of assessment	Qualitative

5.3 Assessment

5.3.1 Variation to render, base coat and top coat

The proposed variations to the render, base coat and top coat are:

- The render is proposed to be NRG Polymer Modified Render instead of ROCKCOTE QRender PM100 as tested. The thickness is to remain unchanged and include grooves in the Greenboard™. The fibreglass mesh must remain as tested.
- The 1 mm texture finish is proposed to be NRG Sand Medium or other similar 1 mm acrylic texture coating instead of ROCKCOTE Sandcote as tested.
- The final acrylic paint coating is proposed to be NRG Shieldcoat instead of ROCKCOTE Armour Flex.

The unexposed side of the wall system tested in EWFA 2581501.2 was faced with 10 mm of Gyprock plasterboard. The exposed face consisted of 75 mm NRG Greenboard™ foam cladding onto which a 10 mm thick ROCKCOTE PM100 QRender Pre-Blended Cement Render and Mesh, ROCKCOTE Sandcote Pre-coloured Acrylic Coating and ROCKCOTE Armor Flex paint was applied.

Throughout the duration of the fire test in EWFA 2581501.2, no flaming was evident on the non-fire side. Also, no flaming was observed during and after the test on the fire side. In addition, it was observed that no gaps formed during the test which would allow the 3 mm probe to pass through. The radiant heat flux recorded on the exposed side was less than the limits prescribed by AS 1530.8.1:2007 for BAL A – 29.

For the duration of the test, the maximum temperature recorded by specimen thermocouples placed on the non-fire side of the wall system was 98ºC. Internal cavity thermocouples recorded a maximum temperature of 94ºC for the duration of the test, and the maximum temperature recorded by internal thermocouples located adjacent to the crib was 50ºC.

It was observed that during test EWFA 2581501.2, the render used on the wall system had cured for four days prior to the day of testing. With reference to internal Warringtonfire (formerly T/A Exova Warringtonfire) testing experience with render coated EPS, it is considered that, in this particular case, a longer period of curing time is not expected to create significant changes to the overall result of the referenced test.

Considering the proposed variations to the render, base coat and top coat, the manufacturer of the ROCKCOTE products tested, Rockcote Enterprises Pty Ltd, has confirmed in writing on 7 October 2011 that the tested ROCKCOTE products have the same material composition as the proposed NRG products as shown in Table 6. Based on the above, these variations are considered name changes rather than changes to the composition.

The thickness of each coating is to be maintained as tested with the render thickness, including the grooves in the Greenboard™.

Table 6 Tested and proposed products

Product	Tested coat	Proposed coat
Render	ROCKCOTE PM 100 QRender,	NRG Polymer Modified Render
Textural finish	ROCKCOTE Sandcote	NRG Sand Medium or other similar acrylic texture coating
Acrylic paint top coat	ROCKCOTE Armour Flex	NRG Shieldcoat

The fibreglass mesh used for the ROCKCOTE PM100 QRender must remain as tested. Other than this, as the NRG Polymer Modified Render is expected to have the same material composition as ROCKCOTE PM100 QRender, this variation to the render is not expected to have a detrimental effect on the fire performance of the wall system.

ROCKCOTE Sandcote is an acrylic based coating system with sand and gravel to achieve various surface finishes. It is applied to be 1 mm thick in the tested system. Due to the 1 mm thickness (nominally 10% of the base render thickness), it is not expected to contribute significantly to the thermal properties of the overall system. Considering this, and that the proposed NRG Sand Medium has the same material composition as the ROCKCOTE Sandcote, this variation to the base coat is not expected to have a detrimental effect on the fire performance of the wall system.

Similarly, the ROCKCOTE Armour Flex paint was applied as a single coat to the tested specimen. Considering this, and that the proposed NRG Shieldcoat has the same material composition as the ROCKCOTE Armour Flex paint, this variation to the base coat is not expected to have a detrimental effect on the fire performance of the wall system.

Based on the above discussion, it is expected that the proposed variations will not adversely affect the performance of the wall system in accordance with AS 1530.8.1:2007 for a BAL A – 29 exposure.

5.3.2 Optional removal of EPS battens

It is proposed that the tested EPS battens can optionally be removed. In test EWFA 2581501.2, 30 mm wide × 26 mm deep (measured) EPS battens were fixed vertically along the timber studs at nominal 450 mm centres, with one at each end of a Greenboard™ section for smaller widths. The 75 mm Greenboard™ cladding was installed over the battens with 10g × 120 mm long bugle head needle point screws with 40 mm diameter Polypropylene impact Copolymer washers at nominal 300 mm centres along the EPS battens.

Post-test observations show that, upon removing the unexposed cladding and sarking, most of the EPS had melted away from the render, leaving a cavity. There was no evidence of smoking or smouldering behind the render in the wall cavity and the render remained in place without spalling, failing away or allowing gaps to form.

Therefore, the presence or absence of the EPS battens is unlikely to adversely affect this behaviour nor provide significant protection to the framing should cavity temperatures reach the melting point of the EPS.

Based on the above discussion, it is expected that optionally removing the EPS battens will not contribute to failure with respect to radiation, insulation and gap formation and will not adversely affect the performance of the wall system in accordance with AS 1530.8.1:2007 for a BAL A – 29 exposure.

5.3.3 Variation to timber framing

Size of timber studs

It is proposed that the dimensions of the timber studs are to be 90 mm × 35 mm or 70 mm × 35 mm instead of the tested 90 mm × 45 mm timber framing configured in accordance with the requirements of AS 1530.8.1:2007 as appropriate for external walls.

When tested, all internal thermocouples within the wall measured temperatures that were less than 100°C, and it is likely that the key mode of heat transfer was via convection of steam from the fire side render coat. At the eaves of the framing, the internal maximum temperature was recorded at 135°C after 7 minutes.

The proposed 70 mm × 35 mm framing size reduces the cavity depth and can therefore cause the cavity temperatures to increase from those measured in the test. Furthermore, the reduced width of

the studs in both the proposed 90 mm × 35 mm or 70 mm × 35 mm framing can reduce the residual timber cross-section available after charring when compared with the tested 90 mm × 45 mm framing.

The temperature at which the charring of timber begins is considered to be 300°C in accordance with BS EN 13381-7:2019[3] and the SFPE Handbook of Fire Protection Engineering[4]. Due to the low temperatures measured in the test and safety margin to 300ºC, it is considered unlikely that the reduction in the timber section, and the corresponding cavity depth, will cause the cavity and stud temperatures to increase up to 300ºC and char for the 60 minute test duration. Therefore, it is not expected that there will be significant deflection of the framing to introduce gap openings greater than 3 mm or to cause flaming on the non-fire side. It is also not expected that reduced cavity depth will cause the internal temperatures to exceed a mean temperature of 250ºC or a maximum temperature of 300ºC for the 60-minute duration, as required by AS 1530.8.1:2007.

The spacing between timber studs must be as tested in order to maintain the same fixing spacing of the plasterboard on the unexposed face and the Greenboard™ on the exposed face as tested.

Therefore, the proposed variations to the timber stud framing are not expected to adversely affect the performance of the wall system in accordance with AS 1530.8.1:2007 for a BAL A – 29 exposure.

Steel framing

It is proposed that the framing can alternatively be made from steel up to 2 mm thick (BMT). The stud depth must be a minimum of 90 mm.

When steel is exposed to an increase in temperature, it undergoes a loss in strength. However, this effect is negligible up to approximately 215°C according to AS 4100:1998 Incorporating Amendment 1[5]. Additionally, differential heating of the steel cross section can occur where the temperature gradient formed produces a traverse deflection of the steel caused by the thermal expansion of the material. If a linear temperature gradient is assumed, the amount of thermal deflection an element undergoes is dependent only on the temperature gradient and not on the actual temperature of the steel. This means that even if a steel element is below 200ºC, if a temperature gradient exists across the section, the stresses within the steel may be significantly increased from those at ambient conditions.

When tested, all the internal thermocouples within the wall system measured temperatures of less than 100°C. At this temperature the key mode of heat transfer is likely to be the convection of moisture laden air throughout the whole wall framing cavity. Therefore, it is expected that the differential deflection of steel stud framing is likely to be negligible. Furthermore, at the eaves of the framing, the internal maximum temperature was recorded to be 135°C after 7 minutes into the test. Therefore, it is not expected that significant deflection of the steel framing will occur and contribute to gap openings in the wall system for the duration of 60 minutes.

The spacing between steel studs must be as tested in order to maintain the same fixing spacing of the plasterboard on the unexposed face and the Greenboard™ on the exposed face as tested.

Therefore, the proposed variations to the stud framing are not expected to adversely affect the performance of the wall system in accordance with AS 1530.8.1:2007 for a BAL A – 29 exposure.

5.4 Conclusion

This assessment demonstrated that if the proposed framed wall system – as applicable for external applications – tested in EWFA 2581501.2, was modified by the proposed variations, the ignition of the exposed side render and the response of the external wall system to the applied radiation level are not expected to be detrimentally affected, and the proposed system can be assigned BAL A – 29 in accordance with AS 1530.8.1:2007.

[3] European committee for standardization, 2019, Test methods for determining the contribution to the fire resistance of structural members – Part 7: Applied protection to timber members, EN 13381-7:2019, European committee for standardization, Brussels, Belgium.
[4] Quincy, Mass, Bethesda, Md, 2002, SFPE Handbook of Fire Protection Engineering, Third Edition. 3rd ed. National Fire Protection Association; Society of Fire Protection Engineers.
[5] Standards Australia, 1998, Steel structures, AS 4100:1998 Incorporating Amendment 1, Standards Australia, NSW.

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 test data, information and experience available at the time of preparation. If contradictory evidence becomes available to the assessing authority, the assessment will be unconditionally withdrawn and the report sponsor will be notified in writing. Similarly, the assessment should be re-evaluated, if the assessed construction is subsequently tested since actual test data is deemed to take precedence.

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 system expected to be demonstrated on a test in accordance with AS 1530.8.1:2007, based on the evidence referred to in this report.

This assessment is provided to NRG Building Systems for their own specific purposes. This report may be used as Evidence of Suitability in accordance with 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 Summary of supporting test data

A.1 Test report – EWFA 2581501.2

Table 7 Information about test report

Item	Information about test report
Report sponsor	NRG Building Systems, Factory 4, 32-38 Dover Driver, West Burleigh, QLD, 4220
Test laboratory	Warringtonfire Australia, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was done on 31 May 2011
Test standards	The test was done in accordance with AS 1530.8.1:2007 Section 15 as appropriate for external walls.
Variation to test standards	The render was conditioned for 4 days in an internal laboratory environment prior to testing.
General description of tested specimen	The test assembly consisted of a nominal 3000 mm wide × 3000 mm long × 211 mm thick wall system. The wall system consisted of two 90 mm × 45 mm timber stud frames with the central frame offset 250 mm back, incorporating an 800 mm × 800 mm timber reveal window. The unexposed side was faced with 10 mm Gyprock plasterboard while the exposed side had a 10 mm ROCKCOTE PM100 QRender and fibreglass mesh (measured density 1540 kg/m^3) over 73 mm NRG Greenboard™ foam cladding. ROCKCOTE Sandcote pre-coloured acrylic coating measuring 1 mm thick (measured density: 1429 kg/m^3) was applied across the entire exposed surface of the specimen. A single coat of ROCKCOTE Armor Flex Paint was applied via roller across the entire exposed surface of the specimen. The specimen was asymmetrical, with the exposed side of the wall coated with render and plasterboard on the unexposed side. 70 mm thick Fletcher Insulation R1.5 Glasswool Wall Batts were cut to size and located between timber studs in the cavity between the wall wrap and plasterboard. Class A type crib was positioned in the corner of the rebate as required by the standard.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.8.1:2007.

The test specimen achieved the following results – see Table 8.

Table 8 Results summary for this test report

Performance criteria		Time to failure (min.)	Position of failure
Formation of through-gaps greater than 3 mm		No failure	-
Sustained flaming for 10 s on the non-fire side		No failure	-
Flaming on the fire exposed side at the end of the 60 minute test period		No failure	-
Radiant heat flux 365 mm from the non-fire side exceeding 15 kW/m^2 from glazed and uninsulated areas		Not applicable	-
Mean and maximum temperature rises greater than 140 K and 180 K respectively		No failure	-
Radiant heat flux 250 mm from the non-fire side exceeding 3 kW/m^2 between 20 and 60 minutes		No failure	-
Mean and maximum temperature of internal faces exceeding 250°C and 350°C respectively between 20 and 60 minutes		No failure	-
Crib Class	**A**	Peak Heat Flux	29 kW/m^2
Test Result		BAL: A – 29	
Post-test observations – Upon removing the unexposed cladding and sarking, it was noted that the majority of the EPS had melted away from the render, leaving a cavity. There was no smoking or smouldering behind the render in the wall cavity.			

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