27 January 2021
Date of Issue

IGNIS ADVISORY NOTE

Evaluation No. IGNL-4137-04-03 Issue 00 Revision 00 [2021]

BENEX PANEL BUSHFIRE COMPLIANCE

1 Executive Summary

Ignis Labs has been engaged by Benex Pacific to undertake a review of the Benex Panel for use in bushfire prone areas and its compliance with AS 3959:2018 for BAL 12.5 to BAL FZ.

Two tests were undertaken in accordance with AS 1530.4:2014 being the Benex panel on its own over a timber frame as well as part of a timber frame wall, insulation and internal plasterboard lining.

The two wall systems satisfied a Fire Resistance Level of at least -/30/30 when tested to AS 1530.4:2014. The details of the two tests are provided below.

Each of the above systems are considered to comply with the requirements of AS 3959:2018 for the requirements of external cladding and decking where applicable for BAL 12.5 to BAL FZ.

2 Fire Resistance Testing

Two pilot wall tests including a 1m x 1m wall specimen in accordance with AS 1530.4:2014 were completed. The furnace size is 1.0m x 1.0m. In accordance with Clause 2.9.2 of AS 1530.4:2014 the test specimen may be less than 3000mm x 3000mm provided the specimen is full size and a clearance of at least 200mm (as per Clause 2.9.6) is achieved.

The test specimen was full size, with respect to the cross-section detail, but had a clearance less than 200mm.

Test 1 – Benex Panel on timber frame

The Benex panel was backed to a pine frame. The specimen wall system from the un-exposed side constituted as follows:

- 35mm × 90mm H3 treated pine frame.
- 35mm test specimen panel

The specimen wall system was stacked within the test equipment opening. The above subject test specimen reflects an external wall system where the FRL is established from the un-exposed (non-fire) side.

FIGURE 1:

SPECIMEN - UN-EXPOSED FACE

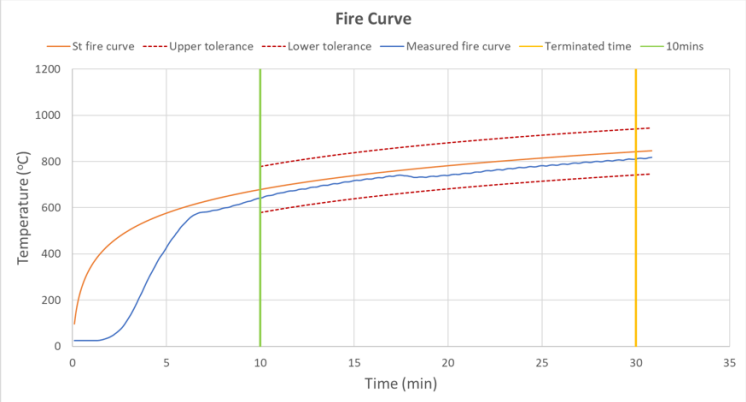
SPECIMEN - EXPOSED FACE

As described by the sponsor, the tested specimen is Benex panel. The Benex panel was made by using Benex mix, which includes sand, cement, lime, and polystyrene. The density of the tested specimen is 1000kg/m^3. The nominal size of the panels is 1.2m×400mm×35mm. In testing, the Benex panel was backed to a timber frame.

The following figure shows the standard curves of temperature versus time for heating the furnace chamber, the tolerance limits, and the actual curve of the average temperature during the test. The furnace temperature was within the range throughout the whole test.

FIGURE 2:

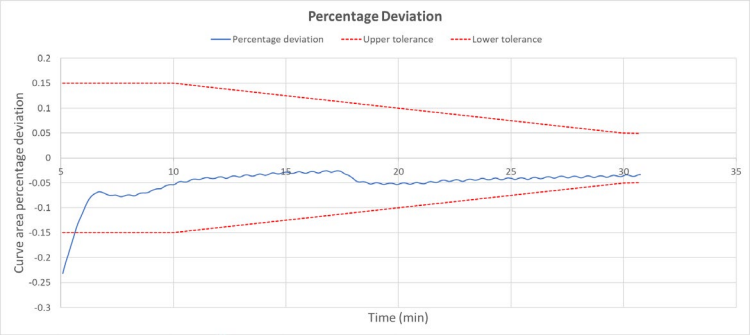
TEST FURNACE TEMPERATURES



The following figure shows the tolerance limits and the actual curve of the percentage deviation in the area of the curve of the average temperature versus for heating the furnace chamber. The percentage deviation was within the range after around 5.6mins.

FIGURE 3:

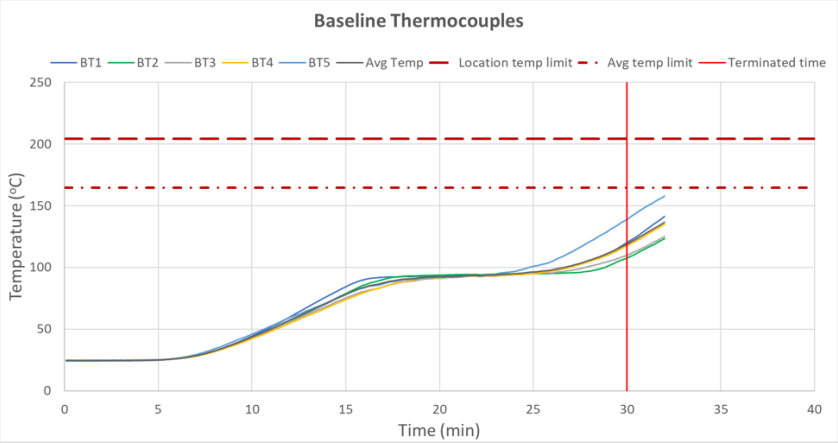
THE PERCENTAGE DEVIATION IN THE AREA OF THE CURVE OF THE AVERAGE TEMPERATURE



The specimen temperature was monitored by five thermocouples distributed at the four corners and at the centre, as shown in Figure 4. The measurements are detailed in the figure below. It is observed that the average temperature on the unexposed face stays within the permissible limit of 140K above the initial temperature for the test duration of 30mins. It is observed that the temperature at all the individual measured locations stays within the permissible limit of 180K above the initial temperature for the test duration of 30mins.

FIGURE 4:

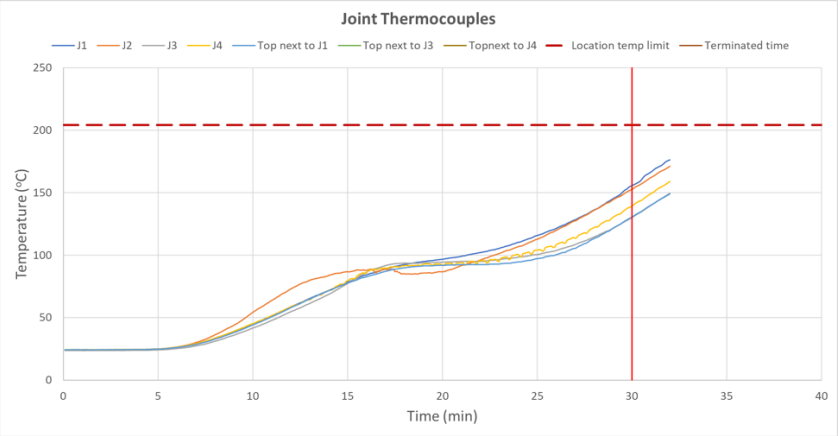
UN-EXPOSED FACE BASELINE TEMPERATURES



To further check the characteristics of the joints, more thermocouples were installed along and offset from each of the joints as shown in Figure 4. The measurements are detailed in the graph below. It is observed that the temperature at any location on the unexposed face of the test specimen stays within the permissible limit of 180K above the initial temperature.

FIGURE 5:

UN-EXPOSED FACE JOINT TEMPERATURES



The performance observed in respect of the following AS 1530.4-2014 criteria:

Criteria	FRL
Structural adequacy	-
Integrity	30 minutes
Insulation	30 minutes

Test 2 – Benex Panel on timber frame with insulation and internal plasterboard lining

The test system is a multilayered system with 35mm Benex panel directly exposed to the fire. The test sponsor joined three separate panels together to form a 1m x 1m Benex panel by using sealant. Then test wall system was sealed to the furnace by using Bostik Fireban® One sealant on the fire exposed side. The specimen wall system from the un-exposed side constituted as follows:

- 10mm gyprock plasterboard
- Glass wool insulation
- 90×35 H3 treated pine frame
- 0.44mm moisture barrier
- 20mm Tophat placed vertically
- 40mm Tophat placed horizontally
- 35mm Benex panel

The specimen wall system was stacked within the test equipment opening. The above subject test specimen reflects an external wall system where the FRL is established from the un-exposed (non-fire) side.

FIGURE 6:

SPECIMEN - UN-EXPOSED SIDE

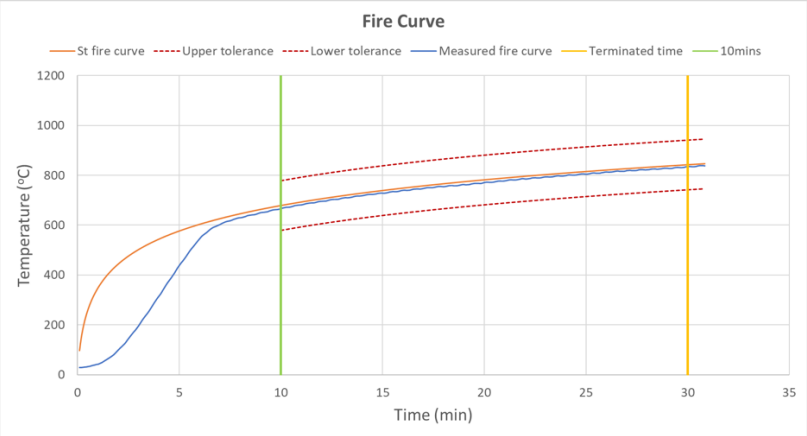
SPECIMEN - EXPOSED SIDE

As described by the sponsor, the Benex panels was made by using Benex mix, which includes sand, cement, lime, and polystyrene. The density of the tested specimen is 1000kg/m3. The nominal size of the panels is 1.2m×400mm×35mm. The Benex panels are glued and screwed to Tophat steel patterns and then rendered with an acrylic render system. Then it was painted with an elastomeric paint. Pine frame was applied to the paint with insulation filled. 10mm gyprock plasterboard was applied on the fire unexposed side of the test wall system.

The following figure shows the standard curves of temperature versus time for heating the furnace chamber, the tolerance limits, and the actual curve of the average temperature during the test. The furnace temperature was within the range through the whole test.

FIGURE 7:

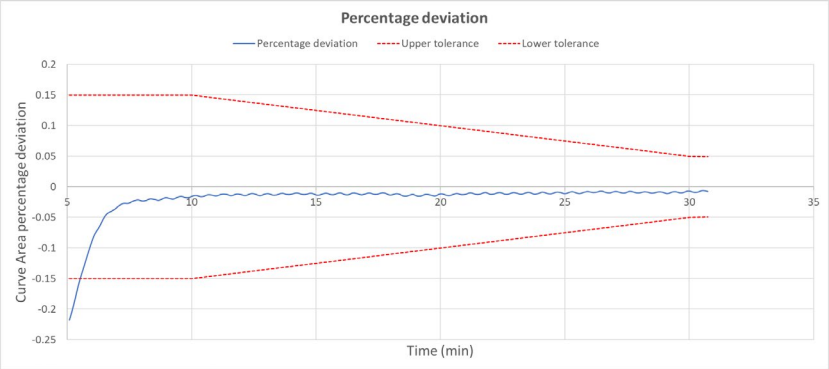
TEST FURNACE TEMPERATURES



The following figure shows the tolerance limits and the actual curve of the percentage deviation in the area of the curve of the average temperature versus for heating the furnace chamber. The percentage deviation was within the range after around 5.6mins.

FIGURE 8:

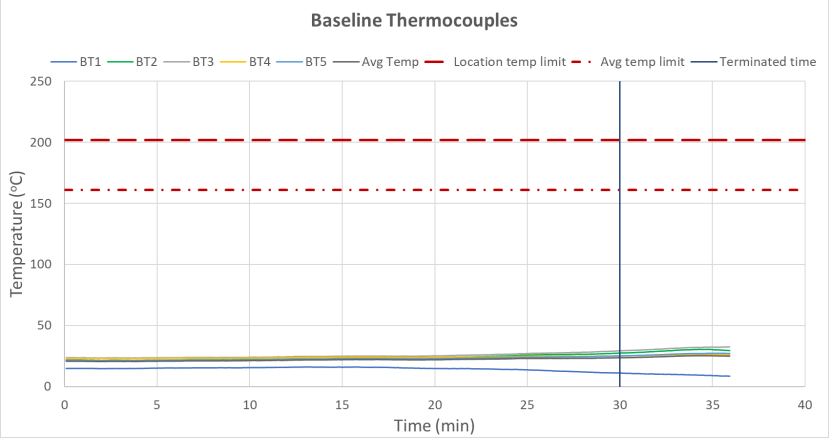
THE PERCENTAGE DEVIATION IN THE AREA OF THE CURVE OF THE AVERAGE TEMPERATURE



The specimen temperature was monitored by five thermocouples distributed at the four corners and at the centre, as shown in Figure 4. The measurements are detailed in the figure below. It is observed that the average temperature on the unexposed face stays within the permissible limit of 140K above the initial temperature for the test duration of 30mins. It is observed that the temperature at all the individual measured locations stays within the permissible limit of 180K above the initial temperature for the test duration of 30mins.

FIGURE 9:

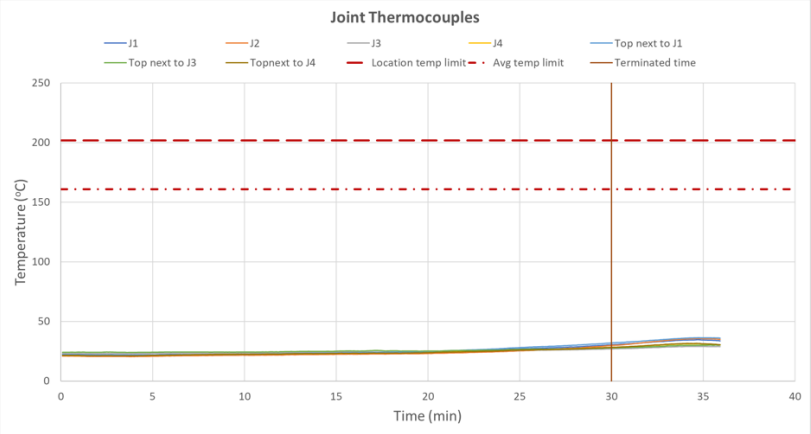
UN-EXPOSED FACE BASELINE TEMPERATURES



To further check the characteristics of the joints, more thermocouples were installed along and offset from each of the joints as shown in Figure 4. The measurements are detailed in the graph below. It is observed that the temperature at any location on the unexposed face of the test specimen stays within the permissible limit of 180K above the initial temperature.

FIGURE 10:

UN-EXPOSED FACE JOINT TEMPERATURES



The performance observed in respect of the following AS 1530.4-2014 criteria:

Criteria	FRL
Structural adequacy	-
Integrity	30 minutes
Insulation	30 minutes

3 Fire Safety Measures

BAL 12.5 to BAL FZ | AS 3959:2018 allows external wall cladding for BAL 12.5 to BAL FZ to be material and wall systems that achieve a Fire Resistance Level of at least -/30/30. In accordance with AS 3959:2018 a higher provision, such as a wall system satisfying a Fire Resistance Level of at least -/30/30 can be applied to lower bushfire provisions. The Benex external wall cladding satisfy this criteria provided the total wall system is at least 90mm in thickness.

Joints | All joints in the external surface material of the wall shall be covered, sealed, overlapped, backed or butt-jointed to prevent gaps greater than 3mm.

Vents and weepholes | vents and weepholes are to be protected as per AS 3959:2018 for the respective BAL zone.

4 Conclusion

The above Benex Panel as detailed above in either wall configuration is considered to be consistent and satisfy the requirements of AS 3959:2018 for BAL 12.5 to BAL FZ areas. Where the Benex Panel is used as an external wall panel, the wall it is attached to must include an internal wall lining and be of at least 90mm in thickness.

Benjamin Hughes-Brown FIEAust CPEng NER APEC Engineer IntPE(Aus)
Chief Executive Officer
Chartered Professional Engineer
CPEng, NER (Fire Safety / Mech) 2590091, RPEQ 11498, BPB-C10-1875, EF-39394
MFireSafety (UWS), BEng (UTS), GradDipBushFire (UWS), DipEngPrac (UTS), DipEng (CIT)