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MAGNUM™ BOARD FLAME SPREAD ASSESSMENT REPORT

MAGNUM® BOARD

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FIRE ASSESSMENT REPORT

FAR 4338

ASSESSMENT REPORT ON MAGNUM BOARD

CLIENT
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New Zealand

ASSESSMENT OBJECTIVE

This report gives the BRANZ assessment of the Group Number Classification in accordance with the New Zealand Building Code C/VM2 (ISO 9705) in relation to the fire hazard properties of wall and ceiling lining materials and assemblies for Magnum Board.

CLIENT

New Zealand Sustainable Forest Products
10 Gannons Road
RD1
Reefton 7895
New Zealand

PRODUCT

Magnum Board

CONCLUSION

For the purposes of compliance with the NZBC Verification Method C/VM2 Appendix A for the Classification of Fire Performance of Wall and Ceiling Lining Materials, the following classification is considered applicable to the product as detailed in Section 2.

Product name	Group Number	Average Specific Extinction Area(m^2/kg)
Magnum Board	1	Less than 250

LIMITATION

This report is subject to the accuracy and completeness of the information supplied.

BRANZ reserves the right to amend or withdraw this assessment if information becomes available which indicates the stated fire performance may not be achieved.

This assessment report may only be quoted or reproduced in full.

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the BRANZ Services Agreement for this work.

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1. INTRODUCTION

This report gives the BRANZ assessment of the Group Number Classification in accordance with the New Zealand Building Code (NZBC) C/VM2 (ISO 9705) in relation to the fire hazard properties of wall and ceiling lining materials and assemblies for Magnum Board.

2. BACKGROUND

This assessment is based on two sets Cone Calorimeter tests conducted to ULC-S135-04 on 100 x 100 mm samples at a heat flux of 50 kW/m^2 follows:

Exova test report Number 13-0020529(A) on 3 mm thick Magnum Board where the mean and peak heat release rate (HRR) were 0.7 and 5.8 kW/m^2 respectively and Average Extinction Area (SEA) (m^2/kg) of 0.0.

Interteck test report number 101433709MID-001Rev1 on 15 mm thick Magnum Board where the mean and peak HRR were 4.15 and 10.14 kW/m^2 respectively and Average Extinction Area (SEA) (m^2/kg) of -1.41.

BRANZ has received written permission from Magnum Building Products to reference these cone calorimeter test reports in the preparation of this assessment of Group numbers in accordance with NZBC C/VM2.

3. TEST STANDARD

The above tests have been conducted in accordance with ULC-S135-04, which is essentially a standard for the cone calorimeter test with no significant differences from the requirements of ISO 5560 in that the same sample size of 100 x 100 mm and the heat flux of 50 kW/m^2 are identical and the output parameters from the oxygen consumption calculations for HRR, and SEA for smoke are comparable. So on this basis the test outputs can be used as a comparison and assessment of what the result would be it the tests had been conducted to ISO 5660.

4. DISCUSSION

The determination for Group Numbers in accordance with the New Zealand Building Code (NZBC) C/VM2 (ISO 9705) from Cone Calorimeter test data collected in accordance with ISO 5660 is detailed in Appendix A as attached on pages 7 and 8.

4.1 HRR to Group Number

The relevant part is of Appendix A is A1.3 and 5 steps are required to determine a Group Number.

Although the process normally requires HRR data in the form of ordered pairs in a spreadsheet from which the calculations involving the ignitability, two integrals, three integral limits and satisfying one inequality. This calculation for Magnum Board was not possible because the required test data was not available in electronic form.

However, from the HRR graphs in the Exova and Interdeck reports in is clear that the peak HRRs recorded are 5.8 and 10.14 kW/m^2 respectively.

Applying the five steps in the calculation process produces the following result:

Step 1: Determine the time to ignition (t_{ig}) which is the time (in seconds) in seconds when the *HRR* reaches or first exceeds a value of 50kW/m^2. For the data provided a *HRR* of 50 kW/m^2 is not reached.

Steps 2, 3, and 4: The calculations cannot be performed. So advancing to step 5.

Step 5 (v): If the ignition criterion in Step 1 is not reached, therefore Magnum Board is deemed a Group 1 material.

4.2 The average specific extinction area (SEA)

In accordance with NZBC Verification Method C/VM2 Appendix A, samples achieving either a Group Number classification 1 or 2, and with an average specific extinction area less than 250 m^2/kg are identified with "S" post-script to the Group number determined above.

The measured average SEA in the Exova and Interdeck reports are 0.0 and -1.41 m^2/kg respectively, so the "S" post-script may be included with the Group Number.

5. CONCLUSION

On the basis of the two cone calorimeter reports:

- Exova test report Number 13-0020529(A) and
- Interteck test report number 101433709MID-001Rev1.

Submitted in support of an assessment of Magnum Board for the purposes of compliance with the NZBC Verification Method C/VM2 Appendix A.

It is considered that the assessed Group Number Classification in Table 1 is considered applicable to the Magnum Board product as described in the above test reports.

Table 1: Assessed performance to NZBC C/VM2

Product name	Group Number
Magnum Board	1-S

Appendix C/VM2

Appendix A (normative): Establishing Group Numbers for lining materials

A1.1 Tests for material Group Numbers

Materials shall be assigned a material *Group Number* when tested to either:

a) ISO 9705 Fire tests – full scale room test for surface products, or

b) ISO 5660 Reaction to fire tests (Heat release, smoke production and mass loss rate) Part 1: Heat release rate (cone calorimeter method); and ISO 5660 Reaction to fire tests (Heat release, smoke production and mass loss rate) Part 2: Smoke production rate (dynamic measurement).

This is except in the following cases:

a) Metal-skin panel assemblies with *combustible* core materials, which shall only be assessed using either the ISO 9705 or ISO 13784 Part 1 test method, or

b) Foil-faced *combustible* materials, which shall only be assessed using the ISO 9705 test method, but if forming part of rigid and flexible ductwork may instead satisfy the requirements of A1.4 a), or

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c) Other products that an accredited test laboratory believes are not appropriate to be evaluated using the ISO 5660 test method due to the configuration or other characteristics of the product. Such products shall be assessed using either the ISO 9705 test or another large scale test if deemed to be appropriate.

Comment:
ISO 5660 is unsuitable in cases where the *fire* performance of the assembly is dominated by the *construction* details rather than the flammability characteristics of the surface material or in cases where, due to the configuration of the material in the test, significant mechanical damage occurs at full scale which does not occur with small, horizontal samples.

A1. 2 Determining a material's Group Number when tested to ISO 9705

For a material tested to ISO 9705, the material's *Group Number* shall be determined as follows:

Group Number 1 material has total heat release not greater than 1 MW following exposure to 100 kW for 10 minutes then 300 kW for 10 minutes

Group Number 1–S material has total heat release not greater than 1 MW following exposure to 100 kW for 10 minutes then 300 kW for 10 minutes and the average smoke production rate over the period 0–20 min is not greater than 5.0 m^2/s

Group Number 2 material has total heat release not greater than 1 MW following exposure to 100 kW for 10 minutes

Group Number 2–S material has total heat release not greater than 1 MW following exposure to 100 kW for 10 minutes and the average smoke production rate over the period 0–10 min is not greater than 5.0 m^2/s

Group Number 3 material has total heat release not greater than 1 MW following exposure to 100 kW for 2 minutes, and

Group Number 4 material has total heat release greater than 1 MW following exposure to 100 kW for 2 minutes.

The rate of total heat release determined in ISO 9705 includes contribution from both the internal lining and the exposure source (100 kW or 300 kW).

The *Group Number* of a material predicted in accordance with Paragraph A1.3 using data obtained by testing the material at 50 kW/m^2 irradiance in the horizontal orientation with edge frame in accordance with ISO 5660 is given by:

Group Number 1 material: as predicted in accordance with Paragraph A1.3

Group Number 1-S material: as predicted in accordance with Paragraph A1.3 and an average *specific extinction area* less than 250 m^2/kg

Appendix C/VM2

Group Number 2 material: as predicted in accordance with Paragraph A1.3

Group Number 2-S material: as predicted in accordance with Paragraph A1.3 and an average *specific extinction area* less than 250 m²/kg

Group Number 3 material: as predicted in accordance with Paragraph A1.3, and

Group Number 4 material: as predicted in accordance with Paragraph A1.3.

A1.3 Determining a material's Group Number when tested to ISO 5660

For a material tested to ISO 5660, the material's *Group Number* must be determined in accordance with the following:

a) Data must be in the form of time and *HRR* pairs for the duration of the test. The time interval between pairs should not be more than 5 seconds. The end of the test (t_f) is determined as defined in ISO 5660, and

b) At least three replicate specimens must be tested.

The following five steps must be applied separately to each specimen:

Step 1: Determine time to ignition (t_{ig}). This is defined as the time (in seconds) when the *HRR* reaches or first exceeds a value of 50 kW/m².

Step 2: Calculate the Ignitability Index (I_{ig}) expressed in reciprocal minutes.

$$I_{ig} = \frac{60}{t_{ig}}$$

Step 3: Calculate the following two *HRR* indices:

$$IQ_1 = \int_{t_{ig}}^{t_f} \left[\frac{q''(t)}{(t - t_{ig})^{0.34}} \right] dt$$

$$IQ_2 = \int_{t_{ig}}^{t_f} \left[\frac{q''(t)}{(t - t_{ig})^{0.82}} \right] dt$$

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Comment:
These definite integral expressions represent the area under a curve from the ignition time until the end of the test, where the parameter is plotted on the vertical axis and time (t) is plotted on the horizontal axis.

Step 4: Calculate the following three integral limits:

$$IQ_{10min} = 6800 - 540 I_{ig}$$

$$IQ_{2min} = 2475 - 165 I_{ig}$$

$$IQ_{12min} = 1650 - 165 I_{ig}$$

Step 5: Classify the material in accordance with the following:

i) If $IQ_1 > IQ_{10}$ min and $IQ_2 > IQ_2$ min, the material is a *Group Number* 4 material

ii) If $IQ_1 > IQ_{10}$ min and $IQ_2 \leq IQ_2$ min, the material is a *Group Number* 3 material

iii) If $IQ_1 \leq IQ_{10}$ min and $IQ_2 > IQ_{12}$ min, the material is a *Group Number* 2 material

iv) If $IQ_1 \leq IQ_{10}$ min and $IQ_2 \leq IQ_{12}$ min, the material is a *Group Number* 1 material, or

v) If the ignition criterion in Step 1 above is not reached, the material is a *Group Number* 1 material.

Repeat steps 1 to 5 above for each replicate specimen tested. If a different classification group is obtained for different specimens tested, then the highest (worst) classification for any specimen must be taken as the final classification for that material.

Comment:
It is expected that the *fire* testing laboratory will determine the material *Group Number* as described in this section when reporting the *fire* test results.

A1.4 Determining a Group Number for surfaces of ducts for HVAC systems

Surfaces of rigid and flexible ductwork for *HVAC* systems shall be assigned either:

a) A material *Group Number* of 1-s when the ductwork complies with the fire hazard properties set out in AS 4254, or

b) A material *Group Number* as determined by A1.2 or A1.3.

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