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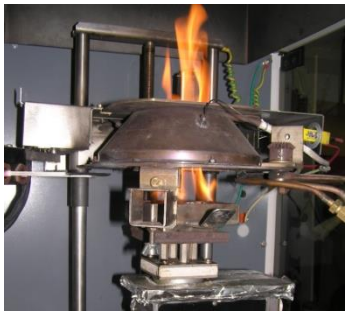

# FIRE TEST REPORT

# FH 5631

## CONE CALORIMETER TEST AND NZBC VERIFICATION METHOD C/VM2 APPENDIX A AND NCC SPECIFICATION C1.10 PERFORMANCE OF CHEVALINE® COLOURCURE-2 SYSTEM

**CLIENT**
Equus Industries Ltd
7 Sheffield St
Riverlands
Marborough 7274
New Zealand

National Association of Testing Authorities, Australia (NATA) and International Accreditation New Zealand (IANZ) are both signatories of the ILAC Mutual Recognition Agreement. Users of test reports are recommended to accept test reports in the name of either accrediting body.

# TEST SUMMARY

## Objective

To conduct cone calorimeter testing and reduce the data in accordance with ISO 5660 and AS/NZS 3837 on client supplied specimens for the purposes of determination of the Group Classifications in accordance with;

- New Zealand Building Code (NZBC) Verification Method C/VM2 Appendix A
- National Construction Code (NCC) Volume One Specifications C1.10 and A 2.4 of the Building Code of Australia (BCA).

## Test sponsor

Equus Industries Ltd
7 Sheffield St
Riverlands
Marborough 7274
New Zealand

## Description of test specimen

The product as described by the client as Chevaline® Colourcure-2 System applied to nominally 4.5 mm fibre cement board.

## Date of test

24 November and 1 December 2014.

## Test results

For the purposes of compliance with the relevant building code documents, the following classification is considered applicable to the tested sample as described in Section 1.

| Building Code Document | Group Number Classification |
|---|---|
| NZBC Verification Method C/VM2 Appendix A | 1–S |
| NCC Specifications C1.10 and A 2.4 | 1<br>The average specific extinction area was less than the 250 $m^2/kg$ limit. |

# LIMITATION

The results reported here relate only to the item/s tested.

# 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.

NATA

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Signed:

**Jennifer Evans**
**NATA CEO**

Date: 24 March 2014

**Dr Llewellyn Richards**
**IANZ CEO**

Date: 24th March 2014

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# SIGNATORIES

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IANZ Approved Signatory

# DOCUMENT REVISION STATUS

| ISSUE NO. | DATE ISSUED | DESCRIPTION |
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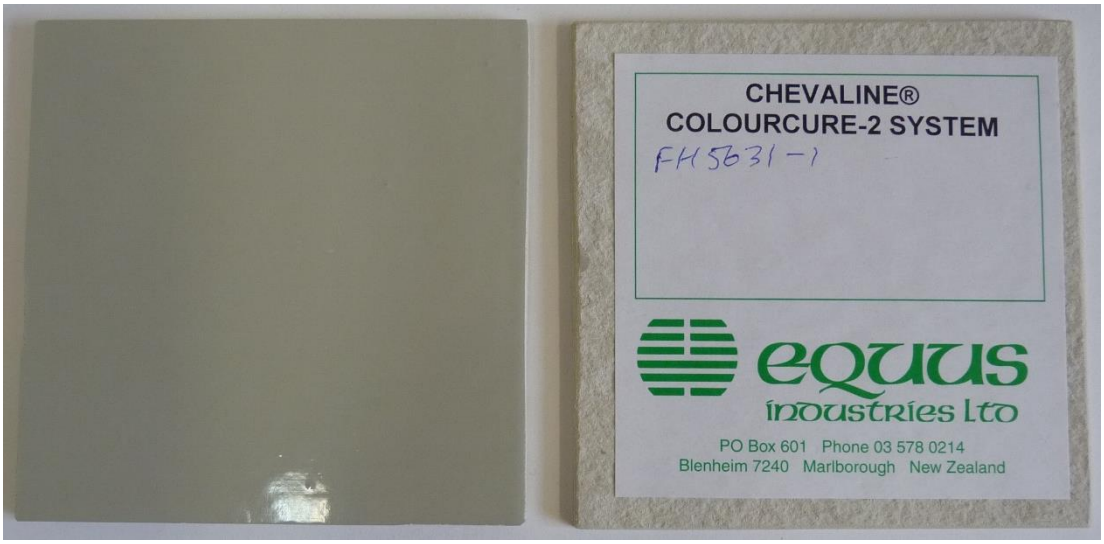
| 1 | 3 December 2014 | Initial Issue |

# 1. GENERAL

The product submitted by the client for testing was identified by the client as Chevaline® Colourcure-2 System applied to nominally 4.5 mm thick fibre cement board. Figure 1 illustrates a representative specimen of that tested.

**Figure 1: Representative specimen (front face on left, back on right)**




## 1.1 Sample measurements

The following physical parameters were measured for each specimen prior to testing.

**Table 1: Physical parameters**

| Specimen ID | Initial properties | | Overall apparent density (kg/m³) |
|---|---|---|---|
| | Mass (g) | Mean thickness (mm) | |
| FH5631-1-50-1 | 64.7 | 4.7 | 1377 |
| FH5631-1-50-2 | 65.7 | 4.9 | 1341 |
| FH5631-1-50-3 | 65.7 | 4.9 | 1341 |

# 2. EXPERIMENTAL PROCEDURE

## 2.1 Test standard

The tests were carried out and data reduced according to the test procedures described in ISO 5660: (2002), Reaction-to-fire tests – Heat release, smoke production and mass loss – Part 1: Heat release rate, and Part 2: Smoke production rate, and AS/NZS 3837:1998 'Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter'; (the test standard). The sample preparation and test procedure were as described in 2.4 and 2.5.

## 2.2 Test date

The tests were conducted on 24 November and 1 December 2014 by Mr Matthew Van Atta at BRANZ Limited laboratories, Judgeford, New Zealand.

## 2.3 Specimen conditioning

All specimens were conditioned to moisture equilibrium (constant weight), at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5% immediately prior to testing.

## 2.4 Specimen wrapping and preparation

All tests were conducted and the specimens prepared in accordance with the test standard. The spark igniter and the stainless steel retainer frame were used. All specimens were wrapped in a single layer of aluminium foil, covering the unexposed surfaces.

## 2.5 Test programme

The test program consisted of three replicate specimens as identified in the above table, tested at an irradiance level of 50 kW/m². All tests were carried out with the specimen horizontal, and with a nominal duct flow rate of 0.024 m³/s.

## 2.6 Specimen Selection

BRANZ was not involved in the selection of the materials submitted for testing. The test materials used were supplied to the laboratory by the client.

# 3. TEST RESULTS AND REDUCED DATA

## 3.1 Test results and reduced data – NZBC C/VM2

**Table 2: Test results and reduced data – NZBC C/VM2**

| Material | | Test specimens as described in Section 1 (in accordance with ISO 5660) | | | Mean |
|---|---|---|---|---|---|
| Specimen test number | | FH5631-1-50-1 | FH5631-1-50-2 | FH5631-1-50-3 | |
| Test Date | | 24/11/2014 | 1/12/2014 | 1/12/2014 | |
| Time to sustained flaming | s | 58 | 56 | 58 | 57 |
| Observations[a] | | - | - | - | |
| Test duration[b] | s | 888* | 896* | 828* | 871 |
| Mass remaining, $m_f$ | g | 53.3 | 55.7 | 56.2 | 55.1 |
| Mass pyrolyzed | % | 17.7% | 15.2% | 14.4% | 15.8% |
| Specimen mass loss[c] | kg/m$^2$ | 1.1 | 1.0 | 0.9 | 1.0 |
| Specimen mass loss rate[c] | g/m$^2$ .s | 1.3 | 1.2 | 1.2 | 1.2 |
| Heat release rate | | | | | |
| peak, $\dot{q}''_{max}$ | kW/m$^2$ | 123.2 | 145.3 | 127.1 | 131.9 |
| average, $\dot{q}''_{avg}$ | | | | | |
| Over 60 s from ignition | kW/m$^2$ | 59.3 | 72.0 | 61.9 | 64.4 |
| Over 180 s from ignition | kW/m$^2$ | 37.5 | 35.0 | 28.5 | 33.6 |
| Over 300 s from ignition | kW/m$^2$ | 24.9 | 23.7 | 18.7 | 22.4 |
| Total heat released | MJ/m$^2$ | 8.4 | 9.1 | 6.0 | 7.8 |
| Average Specific Extinction Area | m$^2$/kg | 49.5 | 86.9 | 78.3 | 71.5 |
| Effective heat of combustion[d], $\Delta h_{c,eff}$ | MJ/kg | 6.5 | 8.1 | 5.6 | 6.7 |

Notes :

[a] no significant observations were recorded

[b] determined by * $X_{O2}$ returning to the pretest value within 100 ppm of oxygen concentration for 10 minutes
** 30 minutes after time to sustained flaming

[c] from ignition to end of test;

[d] from the start of the test

[+] value calculated using data beyond the official end of test time according to the test standard.

NR not recorded

## 3.2 Test results and reduced data – NCC C1.10

**Table 3: Test results and reduced data – NCC C1.10**

| Material | | Test specimens as described in Section 1 (in accordance with AS/NZS 3837) | | | Mean |
|---|---|---|---|---|---|
| Specimen test number | | FH5631-1-50-1 | FH5631-1-50-2 | FH5631-1-50-3 | |
| Test Date | | 24/11/2014 | 1/12/2014 | 1/12/2014 | |
| Time to sustained flaming | s | 58 | 56 | 58 | 57 |
| Observations[a] | | - | - | - | |
| Test duration[b] | s | 228* | 237** | 226** | 230 |
| Mass remaining, $m_f$ | g | 55.9 | 58.7 | 58.8 | 57.8 |
| Mass pyrolyzed | % | 13.7% | 10.6% | 10.5% | 11.6% |
| Specimen mass loss[c] | kg/m$^2$ | 0.8 | 0.7 | 0.6 | 0.7 |
| Specimen mass loss rate[c] | g/m$^2$ .s | 4.8 | 4.2 | 4.3 | 4.5 |
| Heat release rate | | | | | |
| peak, $\dot{q}''_{max}$ | kW/m$^2$ | 123.2 | 145.3 | 127.1 | 131.9 |
| average, $\dot{q}''_{avg}$ | | | | | |
| Over 60 s from ignition | kW/m$^2$ | 59.3 | 72.0 | 61.9 | 64.4 |
| Over 180 s from ignition | kW/m$^2$ | 37.5 | 35.0 | 28.5 | 33.6 |
| Over 300 s from ignition | kW/m$^2$ | 24.9 | 23.7 | 18.7 | 22.4 |
| Total heat released | MJ/m$^2$ | 6.7 | 6.4 | 5.1 | 6.1 |
| Average Specific Extinction Area | m$^2$/kg | 62.2 | 122.2 | 113.3 | 99.2 |
| Effective heat of combustion[d], $\Delta h_{c,eff}$ | MJ/kg | 6.7 | 8.2 | 6.6 | 7.1 |

Notes :

[a] no significant observations were recorded

[b] determined by * average mass loss over 1 minute dropped below 150 g/m$^2$
** two minutes after flameout or other signs of combustion cease
*** 60 minutes have elapsed or 10 minutes without ignition

[c] from ignition to end of test;

[d] from the start of the test

[+] value calculated using data beyond the official end of test time according to the test standard.

NR not recorded

# 4. SUMMARY

The test standards requires that the mean heat release rate (HRR) readings over the first 180 s from ignition for the three specimens should differ by no more than 10% of the arithmetic mean of the three readings. In the event of this criterion not being met, a further three specimens are required to be tested.

**Table 4: Heat release rate**

| Specimen ID | Average HRR over 180s from ignition | Arithmetic mean | % difference from the arithmetic mean |
|---|---|---|---|
| FH5631-1-50-1 | 37.5 | 33.6 | 11.4% |
| FH5631-1-50-2 | 35.0 | | 3.9% |
| FH5631-1-50-3 | 28.5 | | -15.2% |

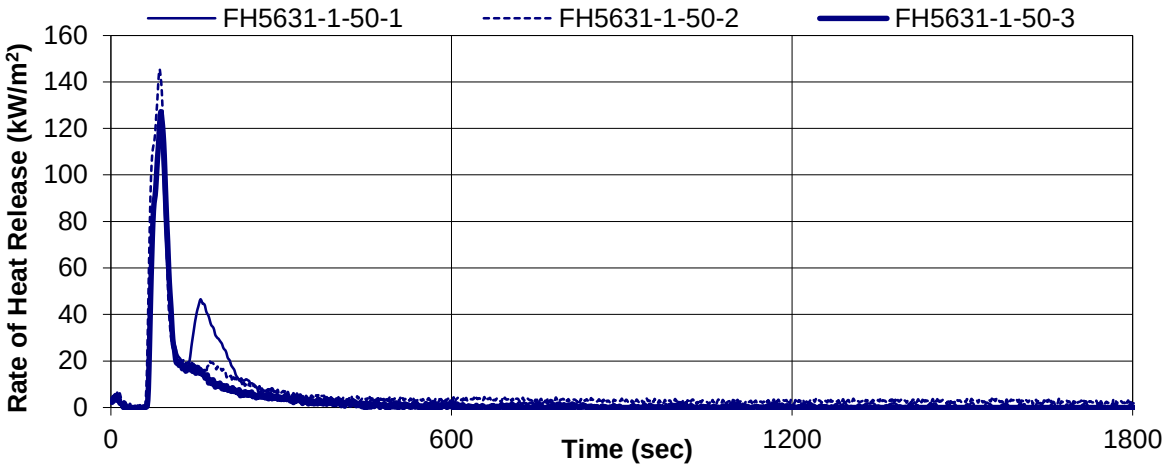
Table 4 identifies two of the specimens exposed to 50 kW/m² irradiance exceeded the acceptance criteria. Although two of the specimens were outside of the variability criteria of the test standard, the same Group Classification was determined for each specimen. A further set of three tests as required by the test standard was deemed not to be necessary and would not be expected to lead to an alteration of the classification.

The report summary for the specimens as described in Section 1, exposed to an irradiance of 50 kW/m² is given in table below with rates of heat release illustrated in Figure 2.

**Table 5: Report summary**

| Mean Specimen thickness (mm) | Irradiance (kW/m²) | Mean Time to Ignition (s) | Mean Peak Heat Release Rate (kW/m²) | Average Specific Extinction Area (m²/kg) |
|---|---|---|---|---|
| 4.8 | 50 | 57 | 131.9 | 71.5 (NZBC)<br>99.2 (NCC) |

**Figure 2: Rate of heat release versus time**



# 5. CLASSIFICATION IN ACCORDANCE WITH NZBC VERIFICATION METHOD C/VM2 APPENDIX A

The following classification has been assessed in accordance with the New Zealand Building Code Verification Method C/VM2 Appendix A: Establishing Group Numbers for lining materials. Calculations were carried out according to section A1.3 for predicting a material's group number for each specimen tested. It states that "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." The classification for the specimens as described in Section 1 is as follows:

**Table 6: NZBC Group classification and smoke extinction area**

| | Sample 1 | Sample 2 | Sample 3 | Classification |
|---|---|---|---|---|
| Group number Classification | 1 | 1 | 1 | 1-S |
| Average Specific Extinction Area ($m^2/kg$) | 49.5 | 86.9 | 78.3 | |

The tested samples recorded an average specific extinction area less than 250 $m^2/kg$. In accordance with 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.

# 6. CLASSIFICATION IN ACCORDANCE WITH NCC VOLUME ONE SPECIFICATION C1.10

Calculations were carried out according to Specification A2.4. The classification and for smoke extinction area for the sample as described in Section 1 is as follows:

**Table 7: NCC Group classification and smoke extinction area**

| | Specimen 1 | Specimen 2 | Specimen 3 | Classification |
|---|---|---|---|---|
| Group number Classification | 1 | 1 | 1 | 1 |
| Average Specific Extinction Area ($m^2/kg$) | 62.2 | 122.2 | 113.3 | |

The average specific extinction area for the sample is less than the 250 $m^2/kg$ limit and therefore it may be used in buildings with or without a sprinkler system complying with Specification E1.5 in accordance with Specification C1.10 Table 2.

# 7. NZBC CONCLUSION

The cone calorimeter testing was carried out on the specimens as described in Section 1. For the purposes of compliance with the NZBC Verification Method C/VM2 Appendix A, the following classification is considered applicable to the material as described in Section 1.

| | |
|---|---|
| **Group Number Classification** | **1-S** |

# 8. NCC CONCLUSION

The cone calorimeter testing was carried out on the specimens as described in Section 1. For the purposes of compliance with the NCC Volume One Specification C1.10 for the Classification of Fire Performance of Wall and Ceiling Lining Materials, the following classification is considered applicable to the material as described in Section 1.

| | |
|---|---|
| **Group Number Classification** | **1** |
| The average specific extinction area was less than the 250 $m^2$/kg limit. | |