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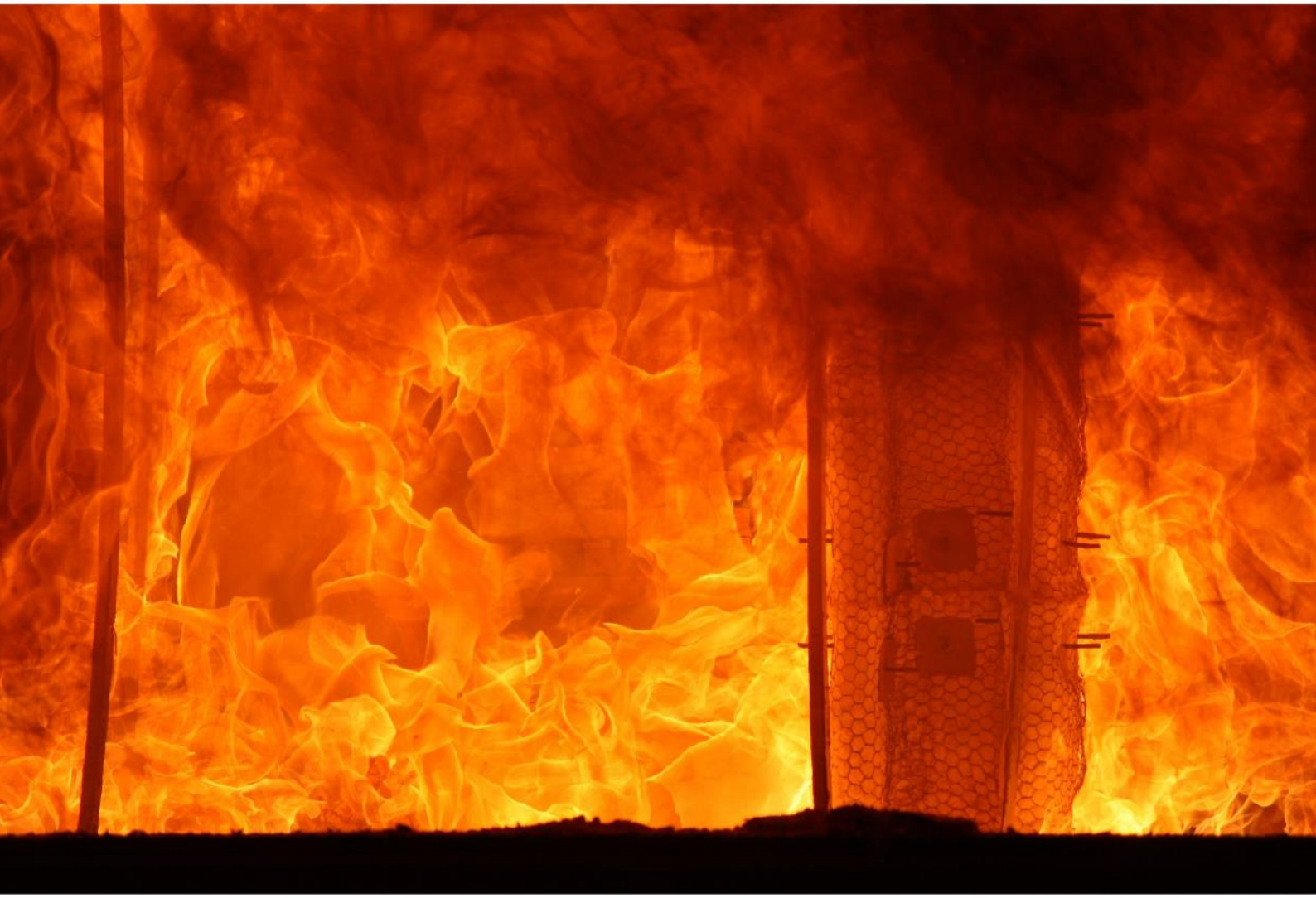

Fire assessment report

The reaction to fire performance of K-13 spray-on insulation classified in accordance with AS 5637.1:2015

Client: International Cellulose Corporation

Product: K-13 Insulation Job number: FAS190168 Revision: R1.0

Issue date: 30 September 2019 Expiry date: 1 October 2024

Amendment schedule

Version	Date	Information relating to report			
R1.0	Issue: 30/09/2019	Reason for issue	Report issued to International cellulose Corporation for review and comment.		
			Prepared by	Reviewed by	Approved by
	Expiry: 31/10/2024	Name	Mahmoud Akl	Omar Saad	Omar Saad
		Signature			

Contact information

Warringtonfire Australia Pty Ltd – ABN 81 050 241 524

Melbourne – NATA registered laboratory
Unit 2, 409-411 Hammond Road
Dandenong South, VIC 3175
Australia

T: +61 3 9767 1000

Brisbane
Suite 6, Level 12
133 Mary Street
Brisbane, QLD 4000
Australia

T: +61 7 3238 1700

Perth
Unit 22, 22 Railway Road
Subiaco, WA 6008
Australia

T: +61 8 9382 3844

Sydney
Suite 802, Level 8
383 Kent Street
Sydney, NSW 2000
Australia

T: +61 2 9211 4333

Canberra
Unit 2, 11 Murray Crescent
Griffith, ACT 2603
Australia

T: +61 2 6260 8488

General conditions of use

Executive summary

This report documents the findings of the assessment undertaken to determine the likely fire hazard properties of K-13 spray-on solution if tested in accordance with AS ISO 9705-2003(R2016)[1] and classified in accordance with AS 5637.1:2015[2]

The analysis conducted in section 5 of this report found that the proposed variations are likely to achieve a Group 1 and 1-s classification as shown in Table 1 and Table 2 , if tested in accordance with AS ISO 9705-2003(R2016) and classified in accordance with AS 5637.1:2015.

Table 1 Variations and assessment outcome to Australian Building Code requirements

Product	Reference test	Variation	Assessment classification	
			Group No.	SMOGRA$_{RC}$ (in m^2s^{-2}×1000)
K-13	RTF190159.1	Thickness of applied coating product shall be between 10mm-75mm	1	2.3
		Performance shall be extended to cover additional brand names such as K-13sp, SonaSpray FC, Ure- K & SonaKrete		
		Product Installation- the product can either be installed as tested or be sprayed on directly to the walls or ceilings.		

Table 2 Variations and assessment outcome to New Zealand Building Code requirements

Product	Reference test	Variation	Assessment classification (group number)	
			Group No.	SMOGRA$_{RC}$ (in m^2s^{-2}×1000)
K-13	RTF190159.1	Thickness of applied coating product shall be between 10mm-75mm	1-S	0.7
		Performance shall be extended to cover additional brand names such as K-13sp, SonaSpray FC, Ure- K & SonaKrete		
		Product Installation- the product can either be installed as tested or be sprayed on directly to the walls or ceilings.		

The variations and outcome of this assessment are subject to the limitations and requirements described in section 2 of this report. The results of this report are valid until 30 September 2024.

[1] Fire tests-Full scale room test for surface products

[2] Determination of fire hazard properties Wall and ceiling linings

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the likely fire hazard of K-13 spray-on solution if tested in accordance with AS ISO 9705-2003(R2016) and AS 5637.1:2015. This assessment was carried out at the request of International Cellulose Corporation. The sponsor details are included in Table 3.

Table 3 Sponsor details

Client	Address
International Cellulose Corporation	12315 Robin Blvd Houston, TX 77045 USA

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 UK[3].

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.

3. Description of the specimen and variations

3.1 System description

The test system consisted of a fire test room where the ceiling and three walls were lined with 16 mm thick fire-rated plasterboard panels coated with K-13 spray-on insulation. The fire test room had studwork walls and ceiling lined with 18 mm thick particleboard and two layers of 16 mm thick fire-grade plasterboard on the internal side. The wall with the doorway was lined with two layers of 25 mm thick kaowool insulation. Without the specimen lining, the internal dimensions of the fire test room were 3600 mm long × 2400 mm wide × 2400 mm high. The short wall opposite the ignition source had a centrally located doorway opening which was 800 mm wide × 2000 mm high.

[3] Guide to Undertaking Assessments In Lieu of Fire Test - The Passive Fire Protection Federation (PFPF), June 2000, UK.

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 test documented in the reports summarised in Table 4. Further details of the tested system are described in Appendix A.

Table 4 Referenced test data

Report number	Test sponsor	Test date	Testing authority
RTF190159.1	International Cellulose Corporation	[05 September 2019]	Warringtonfire Australia Pty Ltd

3.3 Purpose of the test

For the verification of fire hazard properties, the National Construction Code of Australia (NCC) Specification C1.10 requires that a group number of a wall or ceiling lining and the smoke growth rate index or average specific extinction area must be determined in accordance with AS 5637.1:2015.

AS 5637.1:2015 sets out procedures for the assessment of internal wall and ceiling linings according to their tendency to ignite, release heat, cause flashover, release smoke and contribute to fire growth.

In accordance with AS 5637.1:2015, the group number of a material shall be determined by either-

- Physical testing in accordance with AS/ISO 9705-2003 (R2016); or
- If the material has a confirmed correlation, prediction in accordance with Clause 4.4 using data obtained by testing the material at 50kW/m2 irradiance in the horizontal orientation with edge frame in accordance with ISO 5660-1[4] or AS/NZS 3837[5], as appropriate to the test conducted.

The materials group number is an indication of its 'time to flashover' in the ISO room fire test. Flashover refers to the phenomenon of the sudden ignition of almost all of the exposed combustible surfaces within an enclosed room. During an enclosed room fire, a hot layer of smoke can form at the ceiling level which will radiate heat onto exposed surfaces below. When certain materials are heated, they undergo thermal decomposition and can release flammable gases. Flashover occurs when the flammable gases and the majority of the exposed surfaces reach a sufficient temperature for ignition to occur. Ignition is usually sudden and can appear to be almost simultaneous across all exposed surfaces.

The group numbers applicable in New Zealand are determined using the same test data from the

AS ISO 9705-2003 (R2016) test but with different classification criteria. The assigned group numbers are however almost identical applying either criteria. The classification criteria are described in detail in the test report FRT190159.1

AS 5637.1:2015 sets out procedures for the assessment of internal wall and ceiling linings according to their tendency to ignite, release heat, cause flashover, release smoke and contribute to fire growth.

3.4 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 system together with the referenced baseline standard fire tests – are described in Table 5 .

[4] Reaction-to-fire tests — Heat release, smoke production and mass loss rate — Part 1: Heat release rate (cone calorimeter method) and smoke production rate (dynamic measurement)
[5] Method of test for heat and smoke, release rates for materials and, products using an oxygen, consumption calorimeter

Table 5 Variation to tested systems

Item	Reference test	Description	Variations
K-13	RTF190159.1	The thickness of the spray-on solution coating was approximately 65mm±4mm	It is proposed that the thickness of applied coating product is varied to be between 10mm-75mm
		K-13 has different brand names for marketing reasons such as K-13sp, SonaSpray FC, Ure- K & SonaKrete	The report sponsor has confirmed that all the products are the same products made from the same chemical composition with the only difference being their name for marketing reasons.
		Product Installation	It is proposed that the product can either be installed as tested or be sprayed on directly to the walls or ceilings.

3.5 Schedule of components

Table 6 outlines the schedule of components for the assessed system/s subject to a fire test, as referenced in 0.

Table 6 Schedule of components of assessed system

Item	Description	
Lining		
1.	Product	K-13 spray-on insulation
	Material description	The K-13 spray-on system consists of natural cellulosic fibres combined with flame retardants
	Coating thickness	10mm-75mm
	Installation	The product can either be installed as tested or sprayed on directly to the walls or ceilings
2.	Product name	Plasterboard screws (Phosphate coated)
	Installation	If K-13 insulation is sprayed to the panel prior to installation. The panels need to be fixed to the walls and ceiling using plasterboard screws. Fixing dimensions as tested.

3.6 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 insert date, International Cellulose Corporation 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.

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 3.4.
- 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 ISO 9705-2003 (R2016) and AS 5637.1:2015.
- The results of this assessment are applicable to the reaction to fire performance of ceiling and wall linings This report is only valid for the assessed system/s. 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/s 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 of specific variations

5.1 Description of variation

The group number of a material or a system is based on its 'time to flashover' in the AS ISO 9705 room burn test. Flashover usually occurs when the fire is fully developed and all combustible items in the room are involved in the fire. In AS 5637.1:2015, flashover is said to occur when the total heat release rate exceeds 1MW (1000 kW). The fire hazard properties of the specimen are dependent on the rate of combustion of the material and the ability to spread from the origin of fire source. The higher the rate increase in the consumption of the specimen material, the higher the heat release rate and the worse the material performs.

This assessment was undertaken to determine the likely performance of the range of thicknesses of K-13 spray-on solution pre-sprayed on panels as tested or sprayed after the panels are fixed to walls and ceilings.

5.2 Methodology

The approach and method of assessment used for this assessment is summarised in Table 7.

Table 7 Method of assessment

Assessment method	
Level of complexity	Simple assessment – by analysing the rate of heat release due to the lining material in the test room and deduction from the test data
Type of assessment	Comparative

5.3 Assessment

In the reaction to fire test FRT190159.1, the fire test room was lined with 36 panels of various sizes panels pre-sprayed with K-13 on-spray solution to a thickness of 65mm±4mm. The panels were fixed to the walls and ceilings using plasterboard screws.

It is proposed that the thickness of the K-13 applied can be varied between 10mm-75mm. The tested thickness was approximately 65mm. It is considered that the tested thickness represents the most onerous case as it would provide the most fuel for combustion. Moreover, fixing the panels of the pre-sprayed panels is also considered an onerous case as it is expected to create holes in the pre-sprayed panels which will likely introduce some gaps for the flames to get into which might in the process increase the rate of combustion.

From the graph of the heat release rates for the specimen and burner versus time in the test, it shows that there was an increase in the heat release from the combustion of the specimen. The heat release rate was observed to spike in the first 60 seconds reaching an approximate value of less than 200 kW which later stabilized and stayed quite constant for 600 seconds. After 600 seconds, the rate showed another spike reaching less than 800kW which later stabilized after 120 seconds and continued at a constant rate and averaging less than 600kW for the rest of the test.

The test indicates that the specimen did not contribute to an increasing rate of flame spread judging from the photograph of the specimen at the end of the test which shows combustion of the specimen was localised at the vicinity of the flame source along the walls and the ceiling panels directly above the flame source or burner. There was minimal lateral flame spread after the increase of the heat flux to 300kW.

Flashover did not occur right through to the end of the test.

As the tested thickness is expected to provide the maximum fuel for combustion, it is considered that with a thinner layer of K-13 on-spray solution, the rate of heat release will likely be equal or less than the rate of the heat release achieved in the test if tested to AS ISO 9705-2003 (R2016).

It is also considered that the variation of applying the K-13 spray after or before fixing the panels to the walls or ceilings will not introduce any further fuel load that would increase the HRR if tested in accordance with AS ISO 9705-2003 (R2016).

It is also proposed that the test results are extended to include different brand names of K-13 such as K-13sp, SonaSpray FC, Ure- K & SonaKrete. The report sponsor has confirmed that all the products are the same products made from the same chemical composition with the only difference being their name for marketing reasons.

5.4 Conclusion

This assessment demonstrates that the proposed variations summarized in Table 5, are likely to achieve a Group 1 classification if they were tested.in accordance with AS ISO 9705-2003 (R2016) and AS 5637.1:2015.

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 ISO 9705-2003(R2016) and AS 5637.1:2015, based on the evidence referred to in this report.

This assessment is provided to the International Cellulose Corporation 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 – FRT190159.1

Table 8 Information about test report

Item	Information about test report
Report sponsor	International Cellulose Corporation
Test laboratory	Warringtonfire Australia, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.
Test date	The fire resistance test was completed on 05/09/2019.
Test standards	The test was done in accordance with AS ISO 9705-2003 (R2016) and AS 5637.1:2015
Variation to test standards	None
General description of tested specimen	The test system consisted of a fire test room where the ceiling and three walls were lined with 16 mm thick fire-rated plasterboard panels coated with K-13 spray-on insulation. The fire test room had studwork walls and ceiling lined with 18 mm thick particleboard and two layers of 16 mm thick fire-grade plasterboard on the internal side. The wall with the doorway was lined with two layers of 25 mm thick kaowool insulation. Without the specimen lining, the internal dimensions of the fire test room were 3600 mm long × 2400 mm wide × 2400 mm high. The short wall opposite the ignition source had a centrally located doorway opening which was 800 mm wide × 2000 mm high.
Instrumentation	The test report states that the instrumentation was in accordance with AS ISO 9705-2003 (R2016).

The test specimen achieved the following result:

Table 9 Classification for AS ISO 9705:2003 (R2016) and AS 5637.1:2015 (for applications in Australia)

Criteria	Results
Group number	1
$SMOGRA_{RC}$ (in $m^2 \cdot s^{-2} \times 1000$)	2.3

Table 10 Classification for C/VM2-Verification Method: Framework for Fire Safety Design (for applications in New Zealand)

Criteria	Results
Group number	1-S
Average smoke production rate (0 to 20 minutes) (in m^2/s)	0.7