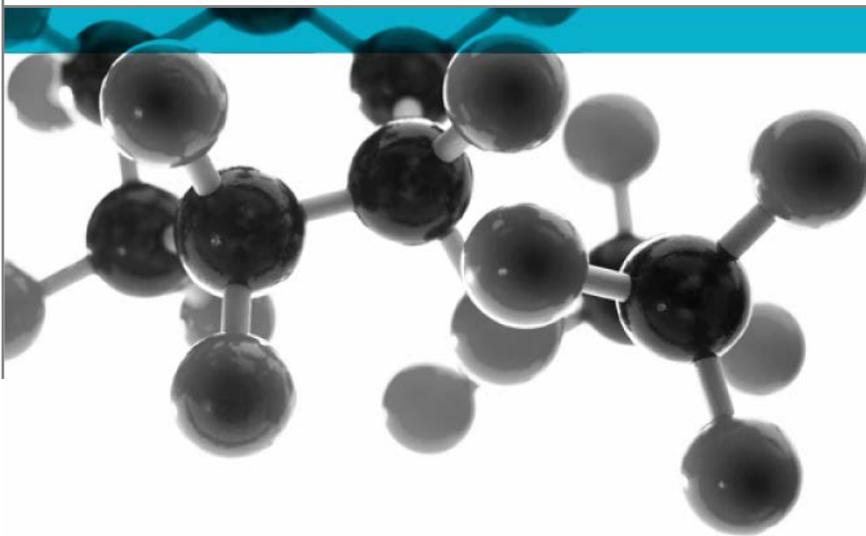


UL 94: 2013 ANSI/UL 94: 2018



Vertical Burning Test For Classifying Materials V-0, V-1 Or V-2

A Report To: Permabond® Engineering Adhesives
Limited

Document Reference: 525945

Date: 15th March 2023

Issue: 1

Page 1



0249

Executive Summary

Objective

To determine the performance of the following material when tested in accordance with Section 8 - "50W (20mm) Vertical Burning Test for Classifying Materials V-0, V-1 or V-2" of UL 94: 2013 ANSI/UL 94: 2018 - 'Test for Flammability of Plastics Materials for Parts in Devices and Appliances'.

Generic Description	Product reference	Thickness	Weight per unit area
Two part acrylic adhesive	"TA4230"	3mm	3.94kg/m ² *
*determined by Warringtonfire			
Please see page 5 of this test report for the full description of the product tested			

Test Sponsor

Permabond® Engineering Adhesives Limited, Wessex Business Park, Wessex Way, Colden Common, Winchester, Hampshire, SO21 1WP

Test Results:

When the test results are assessed using the test criteria specified in the Standard, the material, when tested at a nominal thickness of 3mm, is classified as "V-0".

An uncertainty of measurement estimation has been conducted in relation to the duration of flaming and glowing. The findings are as detailed in Test Results section of this report.

Date of Test

8th December 2022

Signatories



Responsible Officer
D. Roberts *
Testing Officer



Authorised
C. Jacques *
Senior Technical Officer

* For and on behalf of Warringtonfire.

Report Issued: 15th March 2023

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CONTENTS	PAGE NO.
EXECUTIVE SUMMARY	2
SIGNATORIES.....	2
TEST DETAILS.....	4
DESCRIPTION OF TEST SPECIMENS.....	5
TEST RESULTS	6
REVISION HISTORY	8



Test Details

Purpose of test	To determine the flammability of a plastics material when it is tested in accordance with the test procedure specified in Section 8 – “50W (20mm) Vertical Burning Test for Classifying Materials V-0, V-1 or V-2” of UL 94: 2013 ANSI/UL 94: 2018 - ‘Test for Flammability of Plastics Materials for Parts in Devices and Appliances’.
Scope of test	<p>The requirements of UL 94: 2013 ANSI/UL 94: 2018 cover plastics materials and are intended to serve as a preliminary indication of their suitability with respect to flammability for a particular application. The requirements may be applied to other non-metallic materials, if found to be appropriate.</p> <p>The final acceptance of a material by the Underwriter's Laboratories Inc. is dependent upon its use in complete equipment which conforms with the Standards applicable to such equipment.</p>
Fire test study group/EGOLF	Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and has agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.
Instruction to test	The test was conducted on the 8th December 2022 at the request of Permabond® Engineering Adhesives Limited, the sponsor of the test.
Provision of test specimens	The specimens were supplied by the sponsor of the test. Warringtonfire was not involved in any selection or sampling procedure. The results stated in this report apply to the sample as received.
Conditioning of specimens	<p>The specimens were received on the 23rd November 2022.</p> <p>Five specimens were conditioned for at least 48 hours at a temperature of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ prior to testing.</p> <p>Five specimens were conditioned in a circulating air oven for 168 hours at $70 \pm 1^{\circ}\text{C}$ and were then cooled in a desiccator, over anhydrous calcium chloride, for at least four hours at room temperature prior to testing.</p>

Document No.: 525945

Page No.: 4 of 9

Author: D. Roberts

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Issue No.: 1



0249

Description of Test Specimens

The description of the system given below has been prepared from information provided by the sponsor of the test. This information has not been independently verified by Warringtonfire. All values quoted are nominal, unless tolerances are given.

General description / generic type	Two-part acrylic adhesive
Product reference	"TA4230"
Detailed description / composition details	Fire retardant, two-part acrylic adhesive
Name of manufacturer	Permabond Engineering Adhesives
Thickness	3mm (stated by sponsor) 3.77mm (determined by Warringtonfire)
Weight per unit area	3.94kg/m ² (determined by Warringtonfire)
Specific gravity	1.1
Colour	Straw
Flame retardant details	See Note 1 below
Brief description of manufacturing process	See Note 1 below

Note 1: The sponsor was unwilling to provide this information.

Test Results

Test procedure Each specimen was tested in accordance with the test method specified in the Standard and the following points were observed and recorded for each specimen.

- A - Duration of flaming after first flame application (± 0.6 seconds).
- B - Duration of flaming after second flame application (± 0.8 seconds).
- C - Duration of glowing after second flame application (± 0.8 seconds).
- D - Whether or not the specimens burn up to the holding clamp.
- E - Whether or not the specimens drip flaming particles which ignite cotton swatch.

Results The following results were recorded for the ten specimens tested. The letters correspond with those listed under 'Test Procedure'.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Specimens conditioned at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$.

Specimen No.	A	B	C	D	E
1	Nil	4	Nil	No	No
2	Nil	2	Nil	No	No
3	1	2	Nil	No	No
4	Nil	1	Nil	No	No
5	2	2	Nil	No	No

Specimens conditioned at a temperature of $70 \pm 1^\circ\text{C}$ for 168 hours.

Specimen No.	A	B	C	D	E
1	5	1	Nil	No	No
2	Nil	3	Nil	No	No
3	Nil	9	Nil	No	No
4	Nil	5	Nil	No	No
5	Nil	4	Nil	No	No

Conclusion

When the test results are assessed using the test criteria specified in the Standard, the material, when tested at a nominal thickness of 3mm, is classified as “V-0”.

An uncertainty of measurement estimation has been conducted in relation to the duration of flaming and glowing. The findings are as detailed in Test Results section of this report.

The classification requirements can be found in Appendix 1.

Applicability of test results

The test results relate only to the behaviour of the test specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product which is supplied or used is fully represented by the specimens which were tested.

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

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Appendix 1 – Classification Criteria

Criteria conditions	V-0	V-1	V-2
Afterflame time for each specimen t_1 or t_2	≤10s	≤30s	≤30s
Total afterflame time for any condition set (t_1 plus t_2 for the 5 specimens)	≤50s	≤250s	≤250s
Afterflame plus afterglow time for each individual specimen after the second flame application (t_2+t_3)	≤30s	≤60s	≤60s
Afterflame or afterglow of any specimen up to the holding clamp	No	No	No
Cotton indicator ignited by flaming particles or drops	No	No	Yes

If only one specimen from a set of five specimens does not comply with the requirements, another set of five specimens is to be tested. In the case of the total number of seconds of flaming, an additional set of five specimens is to be tested if the totals are in the range of 51-55 seconds for V-0 and 251-255 seconds for V-1 and V-2. All specimens from this second set shall comply with the appropriate requirements in order for the material in that thickness to be classified V-0, V-1 or V-2.

Revision History

Issue No:	Re-issue Date:
Revised By:	Approved By:
Reason for Revision:	

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