

**Assessment of the ability
Of "Avery® 900 Super
Cast" range of self-
adhesive films to meet
the requirements of
'Class 1' and 'Class O'
when applied to a steel
substrate**

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**Avery Dennison Graphics
Division B.V.**

Warringtonfire Test Report No. 157814

Assessment of the ability Of “Avery® 900 Super Cast” range of self-adhesive films to meet the requirements of ‘Class 1’ and ‘Class O’ when applied to a steel substrate

Sponsored By

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Assessment Details

Introduction	<p>This report presents a considered opinion regarding the ability of the “Avery® 900 Super Cast” range of self-adhesive, polyvinyl chloride (PVC) films to achieve the following when applied to one face of a nominally 3mm thick mild steel substrate:</p> <ul style="list-style-type: none"> • A ‘Class 1’ designation when tested in accordance with BS 476: Part 7:1997 • Comply with the requirements of ‘Class 0’, as defined in paragraph A13 (b) of Approved Document B, ‘Fire Safety’, to the Building Regulations 2000
Product Range Considered	<p>The product range considered and evaluated by this assessment comprised “Avery® 900 Super Cast”, a range of self-adhesive, Polyvinyl Chloride (PVC) films which, for the purposes of the evaluation, were bonded to one face of a nominally 3mm the mild steel substrate utilising the film’s integral adhesive system.</p> <p>Information provided by the sponsor in writing prior to this assessment being conducted, indicated that the only variable that exists within the “Avery® 900 Super Cast” range of self-adhesive, Polyvinyl Chloride (PVC) films, relates to colour. The sponsor stated that in all other respects all the products within the range are identical.</p>
Inspection Of Available Colours and Selection of Colours for Test	<p>The “Avery® 900 Super Cast” range of self-adhesive, Polyvinyl Chloride (PVC) films is available in an extensive colour range which includes both ‘Pantone®’, colours and an infinite colour match range (i.e. custom made colours). The opinion contained within this report covers all the colour options within the range. Comprehensive details of the composition of the products within the range are given on Page 7 of this report.</p> <p>The information provided by the sponsor and which detailed all the colours within the range, was examined and a cost effective test programme based exclusively on colour selection was determined and agreed. The selection was designed to provide the basis for a confident appraisal of the performance of all the products within the range when tested as described above, to allow a confident assessment of their ability to comply with the requirements of “Class 1” and “Class 0” to be made.</p> <p>It was considered that in order to provide a foundation for the assessment, indicative tests in accordance with BS 476: Part 6: 1989 and BS 476: Part 7: 1997 would be conducted on all the selected products.</p> <p>A list of the colours of “Avery® 900 Super Cast” that were selected and submitted for testing to BS 476: Part 6: 1989 is detailed in Appendix 1. A total of 16 specimens were tested (one per selection)</p> <p>A list of the colours of “Avery® 900 Super Cast” that were selected and submitted for testing to BS 476: Part 7: 1997 is detailed in Appendix 2. A total of 32 specimens were tested (two per selection).</p>

**Criteria
evaluation**

for The normal criteria for establishing compliance with the requirements for a Class "O" surface as defined in paragraph A13 (b) of approved Document B, "Fire Safety", to the Building Regulations 2000 is as follows:

- In the case of BS 476: Part 6: 1989, a Sub Index s_1 of no greater than 6 and a Total index of performance S of no greater than 12 must be achieved.
- In the case of BS 476: Part 7: 1997, flame spread on five specimens must not exceed 165mm and on the sixth specimen must not exceed 190mm.

To provide the confidence to make a realistic appraisal of all the products included in the "Avery® 900 Super Cast" range and to provide an opinion for the purposes of this appraisal relating the results to the requirements of Class "O" and Class 1, the following additional performance limits were agreed:

- In the case of BS 476: Part 6: 1989, a Sub Index s_1 of no greater than 4 and a Total index of performance S of no greater than 10 must be achieved.
- In the case of BS 476: Part 7: 1997, flame spread of any type (flash, transitory or sustained) as defined in the standard, must not exceed 100mm on all specimens tested.

Additionally, no phenomenon should be observed that may have an effect on the spread of flame over the surface of the product (i.e. delamination of the self adhesive film from the substrate, melting and/or shrinking of the self adhesive film etc).

Results of tests

A summary of the results obtained during each test conducted to BS 476: Part 6: 1989 (sub index ' s_1 ' and the index of performance, 'S') is given in Appendix 1.

A summary of the results obtained during each test conducted to BS 476: Part 7: 1997 (flame spread distance at both at both 1.5 minutes and the final, maximum, flame spread distance, together with any supplementary observations made during the test) is given in Appendix 2.

The Bodycote Warringtonfire reference (WF number) covering the tests is also included in Appendices 1 and 2 of this report.

Examination of test results of The requirements for a 'Class 1' designation in accordance with BS 476: Part 7: 1997 and a 'Class O' surface, as defined in paragraph A13 (b) of Approved Document B, 'Fire Safety', to the Building Regulations 2000, are given in Appendix 3 of this report.

On examination of the results achieved during both the Part 6 tests and the Part 7 tests, it can be seen that all the products tested comfortably complied with the performance criteria defined above. In the case of the Part 6 tests a sub index, 's₁', of 0 (zero) and an index of performance, 'S', of 0 (zero) were achieved for each product tested, and in the case of each specimen tested to BS 476: Part 7, the maximum flame spread distance recorded was <50mm. Additionally, no phenomenon was observed that may have had an effect on the spread of flame over the surface of the product (i.e. delamination of the self adhesive film from the substrate, melting and/or shrinking of the self adhesive film etc).

Form in which the specimens were tested Assembly

Specimen mounting for purposes of tests Each specimen tested to BS 476: Part 6: 1989 was placed over 12.5mm thick by 20mm wide calcium silicate based spacers positioned around its perimeter and mounted onto a backing board so that a 12.5mm enclosed air gap was provided between the unexposed face of the specimen and the backing board.

Each specimen tested to BS 476: Part 7: 1997 was placed over 25mm thick by 20mm wide calcium silicate based spacers positioned around its perimeter and mounted onto a backing board so that a 25mm enclosed air gap was provided between the unexposed face of the specimen and the backing board.

Details Of Product Assessed

The description of the specimens given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description		A self-adhesive film applied to a 3mm thick steel substrate	
Self-adhesive film	Product reference	"Avery® 900 Super Cast"	
	General description	Self adhesive polyvinyl chloride (PVC) film	
	Name of manufacturer	Avery Dennison Division Graphics Europe	
	Colour	"Avery® 900 Super Cast" is available in an extensive colour range which includes both 'PANTONE®' colours and an infinite colour match range (i.e. custom made colours).	
	Overall thickness	80 micron	
	Overall weight per unit area	115 g/m ²	
	Film	Product reference	"Avery® 900 Super Cast"
		Generic type	Polyvinyl chloride (PVC)
		Name of manufacturer	Avery Dennison
		Thickness	50 micron
		Weight per unit area	80 g/ m ²
		Composition details	See Note 1 below
		Flame retardant details	See Note 2 below
	Adhesive	Product reference	"Clear permanent adhesive"
		Generic type	Acrylic adhesive
		Name of manufacturer	Avery Dennison
		Thickness	30 micron
Application rate		The sponsor was unable to provide this information as the application rate varies with the VOC level of the adhesive	
Application method		Roll coating	
Composition details		See Note 1 below	
Flame retardant details	See Note 2 below		
Substrate	Product reference	A product reference is not assigned to this component	
	Generic type	Steel	
	Name of supplier	Westfront	
	Thickness	3mm	
	Density	7800kg/m ³	
	Flame retardant details	The substrate is inherently flame retardant	
Brief description of manufacturing process of self adhesive film		PVC film is manufactured on a cast media. In a 2 nd step, the film is laminated to an acrylic solvent based adhesive which has been processed on a siliconized base paper, through transfer coating technology.	

Note 1 - The sponsor of the test has provided this information but at the specific request of the sponsor, these details have been omitted from the report and are instead held on the confidential file relating to this investigation.

Note 2 - The sponsor of the test has confirmed that no flame retardant additives were utilised in the production of the product / component.

Opinion

Opinion

On the basis of the information that has been generated during the test programme that is described in this report, it is the opinion of Bodycote Warringtonfire that when the product, "Avery[®] 900 Super Cast" (fully described on Page 7 of this report) is applied to a steel substrate having a thickness of 3mm, it would:

- Achieve a Class 1 designation, if tested in accordance with BS 476: Part 7: 1997
- Achieve a fire propagation index, I, of not greater than 12 and a subindex, i_1 , of not greater than 6, if tested in accordance with BS 476: Part 6: 1989

On the basis of the results referred to above, it is also the opinion of Bodycote Warringtonfire that all of the colours within the complete colour range of "Avery[®] 900 Super Cast" (i.e. 'Pantone[®]' colours and the colour match range), if so used, would comply with the requirements for a 'Class O' surface, as defined in paragraph A13(b) of Approved Document B, 'Fire Safety', to the Building Regulations 2000, when the product is applied to a substrate of 3mm thick steel.

Validity opinion


of The above opinion relates only to the "Avery[®] 900 Super Cast" product as described on Page 7 of this report. Any change in the nature of the substrate or in the composition or physical properties of the self-adhesive polyvinyl chloride (PVC) film may significantly affect the performance during the test and will therefore invalidate the test results.

It is the responsibility of the supplier of the product to ensure that the product specification that is supplied is identical to the specification described in this report.

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 assessment reports over two 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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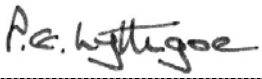
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Appendix 1

Results of Specimens Tested to BS 476: Part 6: 1989 (Bodycote Warringtonfire test reference number 156722)

Specimen No.	Colour reference	Sub index, 's ₁ '	Index of performance, 'S'
1	"Avery 951" / "PANTONE [®] 109C" (Primrose Yellow)	0	0
2	"Avery 910" / "PANTONE [®] 166C" (Dark Orange)	0	0
3	"Avery 906" (Medium Red)	0	0
4	"Avery 959" / "PANTONE [®] 504C" (Rioja Red)	0	0
5	"Avery 948" / "PANTONE [®] 206C" (Purple)	0	0
6	"Avery 968" / "PANTONE [®] 2758C" (Empire Blue)	0	0
7	"Avery 943" / "PANTONE [®] 3165C" (Petrol)	0	0
8	"Avery 971" (Turquoise)	0	0
9	"Avery 916" / "PANTONE [®] 3435C" (Dark Green)	0	0
10	"Avery 900" (White)	0	0
11	"Avery 918" (Grey)	0	0
12	"Avery 901" (Black)	0	0
13	"Avery 990" (Silver Metallic)	0	0
14	"Avery 991" / "PANTONE [®] 4505C" (Gold Metallic)	0	0
15	"Avery 914" / "PANTONE [®] 465C" (Cream)	0	0
16	"Avery 915" / "PANTONE [®] 4625" (Mahogany Brown)	0	0

Appendix 2

Results of Specimens Tested to BS 476: Part 7: 1997 (Bodycote Warringtonfire test reference number 156724)

Specimen No.	Colour reference	Flame Spread at 1.5 minutes (mm)	Final Flame Spread (mm)
1 & 2	"Avery 951" / "PANTONE [®] 109C" (Primrose Yellow)	<50 (both specimens)	<50 (both specimens)
3 & 4	"Avery 910" / "PANTONE [®] 166C" (Dark Orange)	<50 (both specimens)	<50 (both specimens)
5 & 6	"Avery 906" (Medium Red)	<50 (both specimens)	<50 (both specimens)
7 & 8	"Avery 959" / "PANTONE [®] 504C" (Rioja Red)	<50 (both specimens)	<50 (both specimens)
9 & 10	"Avery 948" / "PANTONE [®] 206C" (Purple)	<50 (both specimens)	<50 (both specimens)
11 & 12	"Avery 968" / "PANTONE [®] 2758C" (Empire Blue)	<50 (both specimens)	<50 (both specimens)
13 & 14	"Avery 943" / "PANTONE [®] 3165C" (Petrol)	<50 (both specimens)	<50 (both specimens)
15 & 16	"Avery 971" (Turquoise)	<50 (both specimens)	<50 (both specimens)
17 & 18	"Avery 916" / "PANTONE [®] 3435C" (Dark Green)	<50 (both specimens)	<50 (both specimens)
19 & 20	"Avery 900" (White)	<50 (both specimens)	<50 (both specimens)
21 & 22	"Avery 918" (Grey)	<50 (both specimens)	<50 (both specimens)
23 & 24	"Avery 901" (Black)	<50 (both specimens)	<50 (both specimens)
25 & 26	"Avery 990" (Silver Metallic)	<50 (both specimens)	<50 (both specimens)
27 & 28	"Avery 991" / "PANTONE [®] 4505C" (Gold Metallic)	<50 (both specimens)	<50 (both specimens)
29 & 30	"Avery 914" / "PANTONE [®] 465C" (Cream)	<50 (both specimens)	<50 (both specimens)
31 & 32	"Avery 915" / "PANTONE [®] 4625" (Mahogany Brown)	<50 (both specimens)	<50 (both specimens)

Supplementary Observations

In the case of specimen No.15 (product colour reference "Avery 971" (Turquoise)), all flaming ceased at one minute. Re-ignition occurred during the fourth minute of the test. Sustained flaming occurred approximately 50mm above the reference line (along which flame spread is measured), reaching to a maximum distance of 60mm by 3 minutes 49 seconds.

Appendix 3

Classification of Spread of Flame Given in BS 476: Part 7: 1997

<u>CLASSIFICATION</u>	SPREAD OF FLAME AT 1.5 MIN		FINAL SPREAD OF FLAME	
	LIMIT	LIMIT FOR ONE SPECIMEN IN SAMPLE	LIMIT	LIMIT FOR ONE SPECIMEN IN SAMPLE
	<u>mm</u>	<u>mm</u>	<u>mm</u>	<u>mm</u>
Class 1	165	165 + 25	165	165 + 25
Class 2	215	215 + 25	455	455 + 45
Class 3	265	265 + 25	710	710 + 75
Class 4	exceeding the limits for Class 3			

Definition of 'Class O' in Approved Document B to the Building Regulations

Paragraph A13(b) of Approved Document B, 'Fire Safety', to the Building Regulations 2000 states that a 'Class O' material or the surface of a composite product is either:

a) composed throughout of materials of limited combustibility

or

b) a Class 1 material (as determined by BS 476: Part 7: 1997) which has a fire propagation index (I) of not more than 12 and a subindex (i_1) of not more than 6



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