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PERFORMANCE OF ASBESTOS FIRE BLANKETS

by

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SUMMARY

Fire tests involving liquid fuels (AVGAS and white spirit), frying oil, wood and clothing have been carried out to evaluate the effectiveness of three different sizes of asbestos blankets.

With the AVGAS and white spirit the blankets were tested against fires of increasing size according to the CEN WG/70 Series.

With frying oil the blankets were tested against burning oil, (1B, 2B, 3B, and 5B) with oil heated above the spontaneous ignition temperature.

Wooden cribs were used for assessing the performance of the blankets against cellulosic type fires and burning cloth used to simulate a clothing fire.

The work has shown that the AVGAS tests provide a simple and effective means of assessing the 'rating' of the blankets but additional tests involving frying oil, wood and clothing are necessary to ensure that the blankets are suitable for general applications of this kind.

The results should provide a useful means of assessing the performance of new types of blankets in comparison with the asbestos types.

DEPARTMENT OF THE ENVIRONMENT AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANISATION

PERFORMANCE OF ASBESTOS FIRE BLANKETS

W D Woolley and S P Rogers

1. INTRODUCTION

Asbestos blankets have been in use for many years and provide an effective means of controlling and extinguishing fires during the early stages, to prevent injury to persons and damage to property. In recent years a variety of new cloths have been offered as alternatives to the asbestos fire blankets. In order to assess the performance of these new cloths it is important to first evaluate the performance of the asbestos blanket in a wide range of fire situations, to produce a 'specification' against which the new types can be judged.

This report describes work carried out at the Fire Research Station during September 1976, to evaluate three different sizes of standard asbestos blankets in fire situations typical of those likely to be encountered in practice. The fires chosen for this work involved liquid fuels (AVGAS and white spirit), frying oil, wood, and clothing. Specialised fire protection, such as the use of asbestos blankets to protect stored goods during local welding operations, has not been included.

With the AVGAS and white spirit, the blankets were tested against fires of increasing size according to the 1B to 21B series of the Comite Europeen de Normalisation, Working Group 70¹. A blanket 'rating' was defined as the largest fire which could be extinguished in 2 out of 3 attempts.

With the frying oil the blankets were each tested directly against 1B, 2B, 3B and 5B fires with the oil heated above the spontaneous ignition temperature.

The performance of the blankets against wood fires was evaluated using a range of wooden cribs of fixed cross sectional area and of increasing height.

The ability to extinguish clothing fires was tested using a burning cotton cloth fixed as a 'skirt' over a metal drum to represent a typical torso.

2. EXPERIMENTAL

2.1. Tests with AVGAS and white spirit

The asbestos blankets were tested for ability to extinguish both AVGAS and white spirit fires, of the sizes devised by CEN WG/70 for fire extinguishers on Class B fires. Details of the tray sizes and fuel loadings for fires 1B to 21B are given in the Appendix. All these tests were carried out with a water layer (approximately 15 mm deep) in the bottom of each tray to prevent distortion.

For each experiment the appropriate amount of AVGAS or white spirit was placed in the tray and ignited. The AVGAS was ignited directly with a match. The white spirit was ignited by adding 100 ml of AVGAS to the centre of the tray and then igniting directly with a match. After a preburn time of 1 minute an attempt was made to extinguish the fire. The operator was not permitted to have thermal protection for hands or face during the operation but was permitted to readjust the blanket over the fire after its initial application. Extinction was defined as no flames to be visible after 2 minutes from the application of the blanket. The rating of the blanket was obtained by carrying out an appropriate number of fire tests (with up to 3 experiments per tray size). The largest tray extinguished 2 times out of the three attempts was recorded as the blanket rating. In this way a rating was obtained with both AVGAS and white spirit for each blanket size.

2.2. Frying oil (chip pan)

An appropriate amount of vegetable oil was placed in the trays, 1B, 2B, 3B and 5B, heated with either an electric ring or gas burner until spontaneous ignition occurred. At the onset of flaming the heating supply was disconnected and the oil allowed to burn for an additional 1 minute; an attempt was then made to extinguish the fire using the blankets (single thickness only). Extinction was defined by the absence of any visible flames after 5 minutes from the application of the blanket.

2.3. Wooden cribs

For the solid fuel fires wooden cribs were made from 25 x 25 mm sticks, 300 mm long, with 5 sticks per layer, evenly spaced, to form a 300 x 300 mm square section, with alternate layers of sticks at right angles to each other. A crib was ignited in each experiment using 50 ml AVGAS in a 100 mm diameter tray placed at the centre and base of the crib*. After a 3 minute preburn the crib was covered with the blanket and extinction was defined by the absence of any visible flames after 5 minutes from the application of the blanket (8 minutes total from ignition).

The wood used for the cribs was pinus sylvestris (white pine) conditioned to a moisture content of between 10 and 14 per cent. The blankets were tested on cribs of 10, 15, 20, 25 and 30 layers

* The sticks at the base of the crib were adjusted to accommodate the AVGAS tray

2.4. Clothing fires

The ability of the blankets to extinguish clothing fires was tested using a burning cotton cloth over a simulated torso.

For the test, a steel drum (cylindrical and closed at both ends) of 230 mm diameter and 430 mm high was supported firmly above a table as shown in Fig.1. A 1.5 m length of cotton fabric 600 mm wide was wrapped loosely around the drum without any appreciable overlap, and was secured at the top of the drum with a wire loop. The cotton cloth (160 to 170 g/m²) was ignited with a match at 2 points diametrically opposite to one another and equidistant from the join in the fabric, and permitted to burn for 20 seconds.

The fire blanket was then wrapped around the drum and the flames beaten out. At the end of a further 20 seconds (40 seconds after ignition) the blanket was removed. Extinction was defined as the absence of flames when the blanket was removed. Glowing and smouldering of the cotton was permitted for an extended period.

3. MATERIALS

The asbestos blankets used in this work were made available by the Property Services Agency of the Department of the Environment, and were as specified below:

Code (to denote size)	Approx. size of Blanket		Weight	
	ft	metres	lbs	kg
X	3 x 3	0.94 x 0.93	3 $\frac{1}{4}$	1.47
Y	4 x 4	1.23 x 1.16	5 $\frac{1}{8}$	2.33
Z	6 x 6	1.86 x 1.84	11 $\frac{13}{16}$	5.36

4. RESULTS

4.1. Tests with AVGAS and white spirit

The results of the tests with the 3 blanket sizes, (X,Y and Z) on AVGAS and white spirit fires are given in Tables 1 and 2 respectively.

The 21B fires caused concern because of the real possibility of personal injury, when an operator is placing a large blanket over a fire of considerable size. Although these tests were carried out with this size of fire for this particular exercise, it is not recommended that this fire be adopted for general specification purposes.

4.2. Frying oil

The small blanket (X) successfully extinguished oil fires of 1B, 2B, 3B and 5B.

Frying oil fires of size greater than 5B were not undertaken because of the difficulties in heating large amounts of vegetable oil to a spontaneous ignition temperature, and particularly because of the potential toxicity and irritancy of the degradation products produced during the long heating cycle, in what must be a draught free environment.

4.3. Wooden cribs

The results for single tests of blankets X, Y, and Z on wood crib fires are given in Table 3. The failure of blankets X and Y with fires of 15 and 25 layers respectively was attributed to a size limitation, in that the blankets were physically unable to cover the burning cribs.

4.4. Clothing fires

All blankets X, Y and Z extinguished the clothing fire without apparent difficulty.

5. DISCUSSION AND CONCLUSIONS

This work has shown that the general performance of asbestos blankets can be defined by a series of fire tests using AVGAS/white spirit, frying oil, wood and clothing. As a result of this work the following points have emerged.

1. Asbestos blankets perform well on clothing and wood fires, their effectiveness appears to be limited by physical size only.
2. Fires in frying oil are difficult to perform as a standard test procedure, particularly in excess of 5B. Even the small asbestos blanket (X) was capable of dealing with a 5B frying oil fire.
3. AVGAS provides an effective means of assessing a rating for the blankets. In this respect blankets X, Y and Z are capable of dealing with fires of 2B, 5B and 8B respectively.
4. With white spirit the blanket ratings for X and Y are 8B and 13B respectively. Blanket Z is capable of dealing with a fire of at least 21B. This size of fire, is however considered by the Authors to be hazardous for the classification of fire blankets, by the methods stated, and is not recommended for performance specification purposes.

5. For an evaluation of the overall fire performance of new blankets in comparison with the asbestos types it is recommended that the testing procedure involves
 1. Testing with AVGAS to determine the rating of the blanket.
 2. Direct tests with fires involving frying oil (not less than 3B), wooden cribs (10, 20 and 30 layers for blanket sizes X, Y and Z respectively) and burning cloth as specified.

6. ACKNOWLEDGMENTS

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7. REFERENCE

- (1) CEN Document Pr EN3 Portable Fire Extinguishers - Part 1

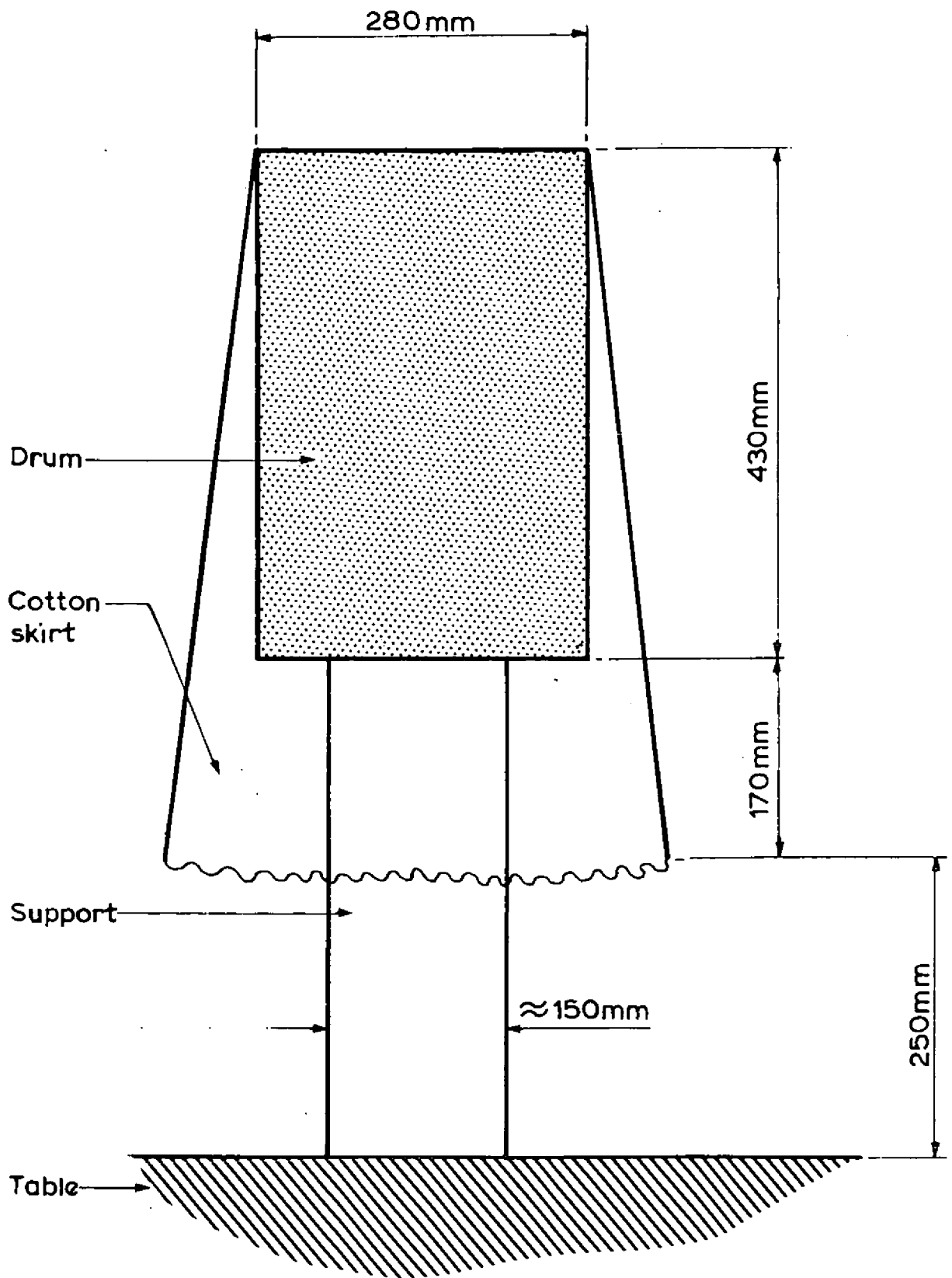


Figure 1 'Clothing fire' fabric and drum dimensions

TABLE 1. PERFORMANCE OF BLANKETS X, Y, Z
ON AVGAS FIRES

Blanket size	Test No	Tray size						
		1B	2B	3B	5B	8B	13B	21B
X	1	-	P	F	-	-	-	-
	2	-	P	F	-	-	-	-
	3	-	-	-	-	-	-	-

Blanket size	Test No	Tray size						
		1B	2B	3B	5B	8B	13B	21B
Y	1	-	-	P	P	F	-	-
	2	-	-	-	F	F	-	-
	3	-	-	-	P	-	-	-

Blanket size	Test No	Tray size						
		1B	2B	3B	5B	8B	13B	21B
Z	1	-	-	-	-	F	F	-
	2	-	-	-	-	P	F	-
	3	-	-	-	-	P	-	-

P - Pass
F - Fail

Blanket rating

X - 2B
Y - 5B
Z - 8B

TABLE 2. PERFORMANCE OF BLANKETS X, Y, Z
ON WHITE SPIRIT FIRES

Blanket Size	Test No	Tray size						
		1B	2B	3B	5B	8B	13B	21B
X	1	-	-	-	P	P	F	-
	2	-	-	-	-	P	P	-
	3	-	-	-	-	-	F	-

Blanket size	Test No	Tray size						
		1B	2B	3B	5B	8B	13B	21B
Y	1	-	-	-	-	-	P	F
	2	-	-	-	-	-	P	F
	3	-	-	-	-	-	-	-

Blanket size	Test No	Tray size						
		1B	2B	3B	5B	8B	13B	21B
Z	1	-	-	-	-	-	-	P
	2	-	-	-	-	-	-	P
	3	-	-	-	-	-	-	-

P - Pass

F - Fail

Blanket rating

X - 8B

Y - 13B

Z - at least 21B

TABLE 3. RESULTS OF FIRE TESTS WITH WOODEN CRIBS

Blanket size	Crib height (layers)				
	10	15	20	25	30
X	P	F ^φ	-	-	-
Y	-	P	P	F ^φ	-
Z	-	-	-	P	P

P - Pass

F - Fail

^φSize limitation see text

APPENDIX

DETAILS OF FIRE TRAY SIZES

Designation	Volume of fuel litres	Area* m ²	Diameter mm	Depth of fuel mm	Depth of tray mm.
1B	1	3.1 x 10 ⁻²	200	32	100
2B	2	6.3 x 10 ⁻²	283	32	100
3B	3	9.4 x 10 ⁻²	346	32	100
5B	5	15.7 x 10 ⁻²	447	32	100
8B	8	25.1 x 10 ⁻²	566	32	100
13B	13	40.8 x 10 ⁻²	721	32	150
21B	21	66.0 x 10 ⁻²	917	32	150

* Given to 3 decimal places only