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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE  
JOINT FIRE RESEARCH ORGANIZATION

THE EFFECTS OF AGEING ON CHARGED 2-GALLON-FOAM-EXTINGUISHERS

by

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Boreham Wood,  
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### Introduction

It is known that in time, changes can take place in the solution used in chemical foam extinguishers, and this may affect their efficiency in extinguishing fires. There may be some conversion of the sodium bicarbonate to sodium carbonate, particularly at high temperatures, with a consequent reduction in the amount of carbon dioxide produced by the reaction of the two solutions. Some of the salts of both solutions may be deposited, particularly under cold storage conditions. Little is known about the effects of ageing upon the stabilisers used.

During the development of a standard fire test for this type of extinguisher, it was found that many of the proprietary charges used produced unduly stiff foams and this prevented complete coverage of the fire area. It was shown that a more fluid foam, that would extinguish the test fire, could be produced if the amount of stabiliser was considerably reduced. This fluid foam was produced using either 0.18 fl.oz. (5cc) of a protein foam compound or 0.25 oz. (7 gm.) of ground liquorice root as stabilisers, much smaller amounts than would normally be used. The overall effects of the changes that may take place on storage when using these very small amounts of stabiliser were studied.

### Test procedure

Six 2-gallon foam extinguishers were obtained from the Admiralty Fire Service, all of these having been stored for two to three years in a hot climate under average temperature conditions in the range 80 to 120°F. Small samples of the outer charge were analysed for sodium bicarbonate content. The extinguishers were then subjected to the "standard" fire test of petrol burning in a circular tray 10 sq. ft in area.

A further eighteen 2-gallon extinguishers were charged, using 30 oz. of Aluminium Sulphate dissolved in 2 pt. of water for the inner solution and 24 oz. of Sodium Bicarbonate in 1½ gal. of water for the outer solution. Of these eighteen, nine extinguishers had 0.18 fl.oz. (5cc) of a protein foam compound added to the outer charge and nine had ¼ oz. (7 gm.) of ground liquorice root added as stabilisers. Twelve of the charged extinguishers were stored in a constant temperature room at 68°F ± 2°F and six in a laboratory where the temperature varied between 37°F and 80°F approximately.

Six extinguishers, from the constant temperature storage and two from the laboratory storage, were subjected to the "standard" fire test after each of the storage periods 1 year, 1½ years and 2 years. (The extinguishers were equally divided between protein and liquorice stabilisers).

The results of all of these tests are tabulated below.

TABLE I

RESULT OF STANDARD FIRE TESTS ON EXTINGUISHERS STORED IN A HOT CLIMATE

Extinguisher No.	Storage temp. (°F)	Ratio $\frac{\text{Na}_2\text{CO}_3}{\text{NaHCO}_3}$	Extinction time (sec)	Remarks	Result of Test
1	85-100	0.17		Not tested	
2	85-100	0.10	195		Passed
3	85-95	0.13	140		Passed
4	80-100	0.35	180		Passed
5	120	1.35	-	Fire extinguished except for two small pockets - burned back to 3 or 4 sq.ft in 15 min.	Passed
6	120	0.30	-	Fire extinguished except for three pockets - burned back to full fire area in 14 min.	Failed

TABLE II  
RESULT OF STANDARD FIRE TESTS FOR EXTINGUISHERS  
WITH REDUCED STABILISER

Period of Storage (years)	Extinguisher No.	Storage Temp. (°F)	Stabiliser	Extinction Time (sec)	Remarks	Result of test
1	7	68 ± 2	Protein Compound	-	Not extinguished, but reduced to edge fire only - little burn back	Passed
	8		Liquorice	200	-	Passed
	9		Protein Compound	-	Extinguisher failed to operate, due to seized lead ball and subsequent loss of liquid.	-
	10		Liquorice	-	Not extinguished, but reduced to edge fire only - little burn back	Passed
	11	Variable	Liquorice	-	Not extinguished, burnt back to 25 sq.ft fire area, but no exposed petrol.	Passed
	12	Protein Compound	315	-	-	Passed
1½	13	68 ± 2	Liquorice	63	-	Passed
	14		Liquorice	-	Not extinguished, but reduced to edge fire only - little burn back	Passed
	15		Protein Compound	153	-	Passed
	16		Protein Compound	90	-	Passed
	17	Variable	Liquorice	-	Not extinguished, but reduced to edge fire only - little burn back	Passed
	18	Protein Compound	330	-	-	Passed
2	19	68 ± 2	Protein Compound	120	-	Passed
	20		Liquorice	170	-	Passed
	21		Liquorice	240	Persistent small flickers of flame for last 90 seconds.	Passed
	22		Protein Compound	195	-	Passed
	23	Variable	Liquorice	-	Fire area covered, except for ½ sq. ft, in 120 seconds - complete burn back in 12 min.	Failed
	24	Protein Compound	-	Practically out in 180 seconds, but 6 or 7 candle size flames persisted, at edge of tray for all of 15 min. of test.	Passed	

### Discussion of results

No significant indication of any effective deterioration of the charges is shown up by these tests. It appears that properly-charged chemical foam extinguishers should remain effective over a period of two years when stored in temperate conditions. Even storage at higher temperatures, with appreciable conversion of the sodium bicarbonate to carbonate, does not greatly affect the fire fighting properties of the foam.

It is evident that satisfactory foam can be produced from greatly reduced amounts of stabiliser at least for protein compound or liquorice, and that this stabiliser is still effective after two years.

### Reference

1. FITTES, D. W. and FRENCH, R. J. Proposed test for charges for 2 gallon chemical foam extinguishers. Department of Scientific and Industrial Research and Fire Offices' Committee, Joint Fire Research Organization F.R. Note 261/1956, Oct. 1956.

### Acknowledgment

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