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THE USE OF COLD WATER FOR CHARGING CHEMICAL FOAM EXTINGUISHERS

by

R. J. French

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Fire Research Station,  
Boreham Wood,  
HERTS.

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## Introduction

When charging chemical foam extinguishers it is usual to use warm water for the outer sodium bicarbonate charge and hot water for the inner aluminium sulphate charge to ensure easy and complete solution of these salts. There is some danger in using warm water for the sodium bicarbonate charge as too high a temperature can cause conversion of the bicarbonate to carbonate with a consequent reduction in the volume of carbon dioxide that can be produced by the reaction of the two solutions.

In many cases, particularly with the Armed Services, warm or hot water may not be available or temperature control may be difficult under the prevailing conditions. If cold water were found to be satisfactory the charging process would be much easier and the need for careful temperature control would be avoided.

The sodium bicarbonate charge provided for an extinguisher gives a 10 per cent solution and should be completely dissolved at 23°C and above. The quantity of sodium bicarbonate is always more than is necessary to complete the chemical reaction with the aluminium sulphate so that sufficient bicarbonate would be taken into solution at temperatures lower than this.

In the case of the aluminium sulphate, it has been shown that practically all the salt can be dissolved at 14°C so that there seems no need to use hot water as advised except as a means of making the mixing process easier.

This note describes a limited number of experiments carried out to study the performances of 2 gallon foam extinguishers which were charged using water at tap temperature.

## Test procedure

Eight extinguishers were charged, the temperature of the tap water being approximately 15°C. Little difficulty was experienced in dissolving the salts at this temperature, all the aluminium sulphate going readily into solution and the quantity of sodium bicarbonate remaining undissolved being negligible.

The stabilisers were added separately. Two ounces (57 gm) of liquorice was used for two of the extinguishers, this being the quantity used in standard charges. The other six had reduced quantities of stabiliser as has been shown to be adequate in a previous investigation<sup>(1)</sup>. After charging, the extinguishers were kept in a heated building until they were tested.

The details of the charges and the periods of storage are given in Table I.

Before testing, samples of the sodium bicarbonate solution were taken for chemical analysis at 7 and 28 days after charging.

The method of testing the performance of these extinguishers was either to examine their discharge characteristics (discharge time and throw) or to carry out the standard 10 sq. ft fire test.

## Test results

The results of these tests are shown in Table II from which it can be seen that the performance of all the extinguishers was similar to that obtained with extinguishers charged according to the normal procedure.

After 7 and 28 days storage the proportion of the original amount of sodium bicarbonate still present in the solution was found by analysis to be 95 and 92 per cent respectively, the rest presumably having been decomposed to sodium carbonate. There was very little free salt at the base of the extinguisher body. The tests show that this reduction in the quantity of bicarbonate was not sufficient to affect the extinguisher's performance.

## Conclusion

It is possible to use cold water at temperatures down to 15°C, for dissolving either of the salts used in chemical foam extinguishers, without adverse effect on their performances.

## Acknowledgment

Acknowledgment is due to Mr. R. M. Forward for his help with the chemical side of this investigation.

## References

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. Internal Note No. 5.

TABLE I

Extinguisher No.	Stabiliser	Period of Storage
1 2	57 grms. (2 oz.) Liquorice	3 weeks
3 4	15 grms. Liquorice	3 months
5 6	15 grms. S.L.S.	3 months
7 8	10 ml. protein compound	3 months

TABLE II

Extinguisher No.	Discharge time (sec)	Time for which 20 ft throw was maintained (sec)	Fire test observations
1			Very fluid foam at first, but stiffer over latter part of discharge. Fire extinguished in $2\frac{1}{4}$ m. Satisfactory performance.
2			Stiff foam over whole discharge time, but fire area well covered. Small edge fire of reducing size lasting for whole 15 minutes. Satisfactory performance.
3	70	40	
4			Persistent small centre fire, but no actual free surface. Satisfactory performance.
5	70	50	
6			Test fire extinguished in 60 sec.
7	70	45	
8			Rather stiff foam towards end of discharge. Still $\frac{1}{2}$ sq. ft of exposed surface at 5 min. reducing in size over last 10 min. Performance satisfactory.