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

THE EFFECT OF WATER HARDNESS ON THE PERCOLATION OF WATER
THROUGH UNLINED CANVAS FIRE HOSE

by

J. A. Gordon

Summary

This report describes experiments made to compare the rate of percolation of tap water and distilled water through unlined canvas fire hose. No significant difference was found between the rate of percolation of the two waters.

This report has not been published and should be considered as confidential advance information. No reference should be made to it in any publication without the written consent of the Director of Fire Research.

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Introduction

Some experiments made at the Building Research Station of the Department of Scientific and Industrial Research on the effect of water hardness appeared to show that the rate of percolation of hard water might be several times greater than that of soft water. These experiments were performed on two types of hose, viz. retted and green flax hose, at various water pressures. The hose was washed for 16 hours in the appropriate water before test, and was therefore not dry at the start, as required in the test to Home Office Specification No. JCDD/1/UL.

Some unpublished experiments made at the same time suggest, without being conclusive, that there might be a difference in the opposite direction between the rates of percolation of the two types of water through hose initially dry, the difference becoming less as percolation continues, and even reversing after a long period of percolation. Further, as a result of some acceptance tests by a Fire Brigade, there appeared to be doubt as to whether hard water percolated at a greater rate than soft water, and additional experiments under controlled conditions were therefore carried out to determine the comparative rates.

Description of tests

Eight three-foot lengths of $2\frac{3}{4}$ in. diameter hose, laboratory reference number AXL, cut from a 60 ft. length, were used for the tests. The hose was conditioned in an atmosphere at a temperature of 40°C and a relative humidity of 60 per cent for not less than 24 hours, and the order of testing the lengths was selected at random.

The lengths of hose were blanked off at one end and were connected in turn to a pressure tank containing tap water. The pressure was then raised to 100 lb/sq.in. over a period of two minutes. Thereafter, measurements of the total amount of water that had percolated after 5, 10, 15, 25, 35 and 45 minutes were made. Hardness measurements were made on samples of water collected from the tank and from the percolate itself.

Result of test

The amount of percolation at various times is shown for each length of hose in Fig. 1.

Table 1 shows the water hardness expressed in parts of CaCO_3 per 100,000 for each length of hose, before and after passing through the hose.

Table 1

Type of water	Hose number	Hardness (parts CaCO ₃ /100,000)	
		Water from tank	Water from hose
Distilled water	AXL 1	0.2	1.4
" "	AXL 2	nil	0.8
" "	AXL 6	0.2	0.8
" "	AXL 8	0.2	0.5
Tap water	AXL 3	30.6	30.6
" "	AXL 4	31.6	31.0
" "	AXL 5	31.6	31.9
" "	AXL 7	31.3	31.3

Discussion

The results in Fig. 1 show that any difference between the percolation of tap water and distilled water is far from significant statistically, when compared with the difference between one 3 ft. length and another. There is a factor of variation of 2 to 3 between the maximum and minimum of the 4 rates of percolation between 15 and 25 minutes for both kinds of water and this variation is far greater than variations due to the type of water used.

It appears that when distilled water was used, the percolate leached out material from the hose. The resultant increase in the hardness of the distilled water was small compared with the difference between the hardness of distilled and tap waters.

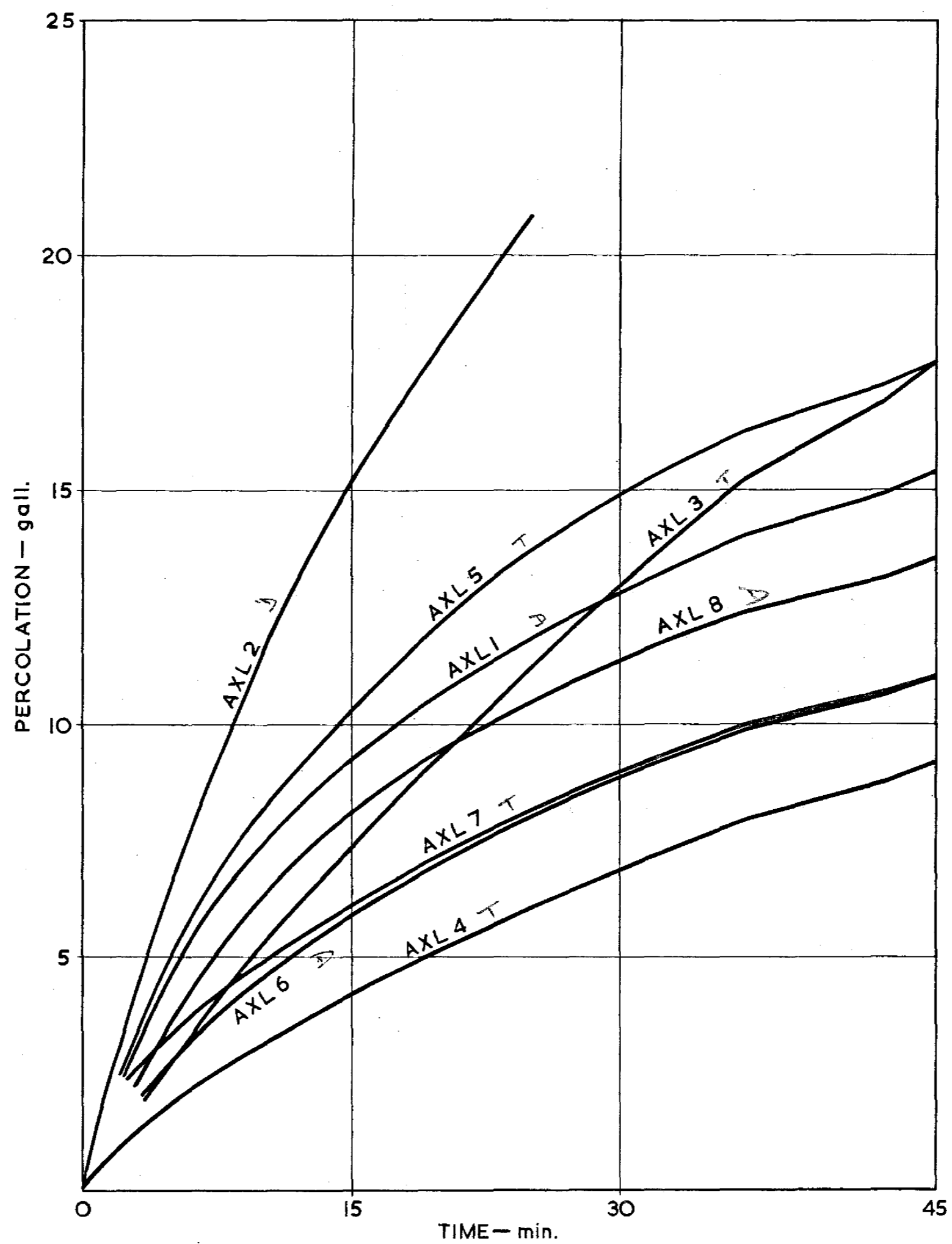
Conclusions

The hardness of water in itself has no noticeable effect on the percolation of water through canvas hose.

References

"Some Experiments on the Percolation and Durability of Unlined Canvas Hose". B.R.S. T.C. Note 1188. May, 1943.

A summary of the same work appears in "Some Notes on Fire Hose". D.S.I.R., F.O.C., J.F.R.O., F.P.E. Note 26/1950.



AXL 1	} Distilled water	AXL 3	} Top water
AXL 2		AXL 4	
AXL 6		AXL 5	
AXL 8		AXL 7	

FIG. 1. THE EFFECT OF WATER HARDNESS ON PERCOLATION THROUGH UNLINED CANVASS FIRE HOSE