

F.R. Note No.498

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

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A SUMMARY REPORT OF THE SOUND LEVELS OF AUDIBLE WARNING DEVICES

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Summary

This note tabulates the results of measurement of the sound levels of various types of audible warning devices which may be used on fire appliances.

April 1962

Fire Research Station,
Boreham Wood,
HERTS.

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Introduction

At the request of the Design and Development Committee of Fire Brigade Appliances and Equipment of the Central Fire Brigades Advisory Council, an investigation was made by the Joint Fire Research Organization to assess the relative effectiveness of four different types of audible warning device⁽¹⁾. It was shown that the traditional bell would be inaudible to the driver of a heavy diesel lorry under normal driving conditions, and as a result attempts were made to increase the intensity of the sound from the bell by amplification. Measurements of an amplified bell were made using commercial equipment⁽²⁾ and equipment used by the police and fire brigades⁽³⁾, ⁽⁴⁾.

This note summarises the results of this investigation and compares the relative distances at which each of the warnings can be heard by the driver of a heavy diesel lorry against the background noise made by his own engine.

Experimental

Measurements made inside the cab of a heavy diesel lorry whilst it was being driven along an open road at a steady speed and also through traffic in a built-up area indicated that the driver was likely to be subjected to an average background noise level of about 90 decibels (dB). Laboratory experiments were made to find the threshold levels of audibility of four different types of audible warning against this background. It was found that each of the warnings had a similar threshold level - approximately 80dB - and frequency or other characteristics did not make one warning more easily heard than another.

Measurements were made of the sound level inside the cab of a stationary lorry, with the engine switched off and the windows closed, due to each of four different types of warning at various distances. The results plotted graphically showed that the four curves obtained had similar slopes. Other measurements were made at a fixed distance of 50 ft and the assumption was made that a curve through each point thus obtained also had a similar slope. It was therefore possible to project the curve to obtain the distance of the warning device so that the sound level in the cab would be the threshold level of 80dB.

Summary of experimental results

The sound levels inside the cab of a stationary lorry due to each of the warnings 50 ft away are given in Table I. The distances at which a sound level of 80dB, the threshold level against a background of diesel lorry noise, was obtained is also included in this table.

Table I.

Sound Levels at 50 ft and threshold distances of audible warnings

Original Report	Description of Warning	Sound Level at 50 ft. (dB)	Distance at which sound level 80 dB (ft)	Remarks
F.R. Note No.440	4-horn system	90	130	Average reading of sound level meter
	Two-tone pneumatic horns	88	100	Average reading of sound level meter
	Bell (unamplified)	65	less than 5	Average reading of sound level meter
	Siren (steady note)	81	55	Average reading of sound level meter
Internal Note No.89	Bell, amplified by commercial equipment using 26 in. exponential horn	84	70	Average reading of sound level meter
Internal Note No.115	Bell, unamplified, hand operated	70	12	Minimum reading of meter
	Bell, amplified by Home Office equipment, police-type loud hailer	78	40	Minimum reading of meter
	Bell, amplified by modified Home Office equipment, police-type loud hailer	84	70	Average reading of meter
	Bell, amplified by two Home Office amplifiers, two police-type loud hailers	90	130	Average reading of meter
	Repeat of Internal Note No.89	84	70	-
	Bell, hand operated, C & S amplifier, police-type loud hailer	79	45	-

Conclusions

The experiments have shown that it is possible to amplify the sound from a fire appliance warning bell to a level at which it is comparable with other types of audible warning.

It is emphasised that the distances quoted in Table I are relative, and that the actual values might be expected to vary under different conditions, such as

the direction of the wind, the position of the warning relative to the lorry, and also the size of load carried.

References

1. EMSON, I.C., HIRD, D. and PICKARD, R.W. Audible Warnings for Fire Appliances. Joint Fire Research Organization. F.R. Note No.440
2. EMSON, I.C., A sound Level Measurement of an Amplified Fire Appliance Warning Bell. Joint Fire Research Organization. Internal Note No.89
3. EMSON, I.C. Some sound Level Measurements of Amplified Fire Appliance Warning Bells. Joint Fire Research Organization. Internal Note No.115.