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VIBRATIONS TO WHICH DRY POWDER EXTINGUISHERS MAY BE SUBJECTED DURING STORAGE

by

P. F. THORNE

FIRE RESEARCH STATION

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Fire Research Station,
Borehamwood,
Herts.
ELStree 1341

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Introduction

Dry powders are often stored where they may be subjected to vibrations, such as in buildings where there is heavy machinery, and on vehicles or ships. It is possible that certain amplitudes and frequencies of vibration can cause consolidation or "packing" of the powder which in turn will have an adverse effect on the discharge of the extinguisher when it comes to be used.

A review of the levels of vibrations likely to be encountered in various locations has been made, in order to provide information for use when designing experiments to investigate the "packing" of powders by vibrations.

Summary of available data

Table 1 summarises the levels of vibrations likely to be encountered in various locations. The ranges of frequencies, amplitudes and resulting 'peak accelerations' are wide but it can be seen that the lowest levels of vibration likely to be experienced occur in buildings and sea transport. Peak accelerations are unlikely to exceed 1 g_n in buildings, and 1.5 g_n at sea, with maximum frequencies of 60 c/s to 80 c/s. The highest levels appear to occur in aircraft with 'peak accelerations' reaching 20 g_n at 500 c/s near engines and up to 5 g_n at 150 c/s elsewhere.

The vibrations found in road vehicles vary with the type of vehicle, the type of surface over which it is travelling, and the location on the vehicle. Suspension systems vibrate at low frequencies (5 c/s) but 'peak accelerations' can reach 5 g_n. Bodywork, including storage space, can vibrate between about 10 c/s and 70 c/s with 'peak accelerations' of up to 1 g_n to 2 g_n.

Table 1

Levels of vibrations found in various locations

Location	Frequency (c/s)	Amplitude (cms)	Peak Acceleration (g_n)	Reference
Buildings				
1) Near Road and Rail Transport	10 - 60	Up to 0.001	Up to 0.2	(2)
2) Near heavy machinery	8 - 35	Up to 0.023	Up to 1.0	(2)
Large ships e.g. Aircraft Carrier				
1) Stern	2	$\pm$ 0.38	$\sim$ 0.1	(1)
	50	$\pm$ 0.0076	0.8	(1)
2) Waist and forecastle	5	$\pm$ 0.064	$\sim$ 0.01	(1)
Small water craft				
1) Stern	5 - 15	$\pm$ 0.0305	$\sim$ 0.2	(1)
2) Waist and forecastle	5 - 15	$\pm$ 0.013	$\sim$ 0.1	(1)
	80	$\pm$ 0.0051	$\sim$ 1.5	(1)
Unspecified Road Vehicles				
1) Goods in transit	1 - 3		$<$ 3.0	(1)
	15 - 40		1.0	(1)
2) Suspension	2 - 4		3.0 - 5.0	(1)
3) Body	8 - 15		1.0	(1)
4) Engine	20 - 60			(1)

Table 1 (Cont'd)

Location	Frequency (c/s)	Amplitude (cms)	Peak Acceleration (g_n)	Reference
30 cwt to 10 ton lorries				
Floor over rear axle	Continuous spectra peaking at 3 c/s, 20 c/s and 70 c/s		1.0 to 1.5 r.m.s.	(4)
Unspecified Road Vehicles				
1) Suspension	2 - 3		Mean value of ~0.4	(5)
2) Wheel hop	10 - 20		Maximum value ~ 1.0	(5)
3) Body	30 - 50			(5)
Vehicle based on 6x6 chassis and suspension				
This forms the basis of some Airfield Fire Crash Tenders.				
1) Front and sides of body	6 - 60		max. 1.2	(3)
	1		max. 1.4	(3)
2) Centre of floor at rear	5 - 8		max. 2.0	(3)
	18		max. 1.0	(3)
Rail Transport				
Goods in transit	2	± 0.005	± 1.5	(1)
	100		± 2.0	(1)

Table 1 (Cont'd)

Location	Frequency (c/s)	Amplitude (cms)	Peak Acceleration (g_n)	Reference
Unspecified Aircraft				
1) Central fuselage	3 - 150	± 0.025 to ± 0.0076	up to 5	(1)
2) Near engine nacelles	10 - 500	± 0.038 to ± 0.0025	up to 20	(1)
3) Tailplane and extremities	3 - 150	± 0.076 to ± 0.0076	up to 5	(1)

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