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EXPLOSIVE PERFORMANCE

SANL 712-004

P. E. Kramer

January, February, March 1970

ATOMIC ENERGY COMMISSION
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MASTER

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The determination of detonation velocity, shock sensitivity, impact sensitivity, etc.; and the acquisition of high precision one-dimensional hydrodynamic data for use in establishing detonation product equations of state, performance of explosives, etc.

ABSTRACT

A one-inch diameter cylinder test was fired with LX-07-2 Lot HOL 902-1.

A wedge test series on LX-07-1 was completed. Shock sensitivity appears to be less than for LX-10-0 but slightly higher than for LX-09-0.

One snowball test was conducted with LX-07-2. It was discovered that a change in the detonators employed had occurred.

DISCUSSION

A one-inch cylinder-detonation velocity test was fired with LX-07-2 Lot HOL 902-1 at a density of 1.859 gm/cc. Detonation velocity was 8652 m/sec with a 95 percent confidence interval of 4 m/sec. Streak record analysis yielded the following expansion information:

T(μsec)		V(mm/μsec)	
$R - R_0 = 5mm$	$R - R_0 = 19mm$	$R - R_0 = 5mm$	$R - R_0 = 19mm$
4.014	12.323	1.533	1.772

One snowball test was fired with LX-07-2 Lot 902-1. When transit times appeared to be faster than expected it was noted that detonator breakout time was .25 μsec earlier than normal. It was finally determined that a supposedly insignificant detonator change had occurred. A supply of the older detonators was located and will be employed on future tests.

A three-shot wedge test series was conducted with LX-07-1 Lot 90B. Results are summarized in the Table.

Table

Wedge Test Series with LX-07-1 Lot 90B ρ = 1.860 gm/cc

Shot No.	Booster (1")	Attenuator(s)	P_i (kbar)	P_t (kbar)	Distance to Detonation (mm)	Time to Detonation (μsec)	Excess Transit Time (μsec)
1	CB-3	Brass - 1"	242	86	2.2-2.3	.48	.22
2	Baratol	Brass - ½"	184	63	4.1	.91	.44
3	Baratol	Plexiglas - ½" Brass - ½"	153	49	5.2	1.26	.66

For a given incident pressure, the pressure transmitted to LX-07-1 was lower than for either LX-10-0 or LX-09-0. This effect was not due to density since the density of LX-10-0 was no higher and that of LX-09-0 was much lower.

A log-log plot of transmitted pressure against distance to detonation does not display the linearity usually achieved in this type of series. Because of the off-white color of this material, it was feared that insufficient light would be reflected into the camera, so each wedge was partially covered with aluminum foil and a double slit arrangement was employed to allow viewing both the covered and the bare HE. Since information from foil or Mylar-covered HE is not considered to be extremely reliable, and since sufficient light was available from the bare material, all reported results were derived from the bare HE traces. Velocities obtained from covered and uncovered portions were in good agreement. However, it would be expected that the transition to detonation would appear on the foil at the same time or later than on the bare HE. In shots 1 and 3, the transition on the foil side was slightly later. In shot 2, however, the transition appeared on the foil side at 3.8 mm as opposed to 4.1 mm in the bare HE. It does not seem reasonable that this reflects reality, but rather that the existence of some problem is indicated. Any attempt to explain what happened would at present be pure conjecture, but it should be noted that the value of 3.8 mm indicated by the foil would be more consistent with the results of shots 1 and 3.

FUTURE WORK; COMMENTS; CONCLUSIONS

With return to the proper detonators, future snowball tests should be consistent with past results.

LX-07-1 is less shock sensitive than LX-10-0 but appears to be slightly more sensitive than LX-09-0 (in terms of transmitted pressure).