WATERTOWN ARSENAL LABORATORY

MEMORANDUM REPORT

NO. WAL 710/752

Resistance of a Magnesium Alloy, Dowmetal (Type J-1), to Perforation by Fragment-Simulating Projectiles

BY

J. F. Sullivan
Asst. Engineer

M. A. Brough
Proof Technician

DATE 11 June 1945

WATERTOWN ARSENAL
WATERTOWN, MASS.

WATERTOWN ARSENAL LABORATORY

MEMORANDUM REPORT NO. WAL 710/752

32nd Partial Report on Problem B-8.2

11 June 1945

Resistance of a Magnesium Alloy, Dowmetal (Type J-1), to Perforation by Fragment-Simulating Projectiles

1. As part of a program of development of improved armoring components for body armor assemblies, samples of a magnesium alloy, Dowmetal (Type J-1), have recently been tested at this laboratory.

2. The resistance of these samples to perforation by cal. .45 steel-jacketed ball projectiles and by cal. .22 fragment-simulating projectiles, G-2[1], at normal incidence, was spectacularly lower than that of an equivalent weight of Hadfield manganese steel. When impacted obliquely their resistance to perforation by the G-2 improved slightly as the obliquity increased, but although the resistance of Hadfield manganese steel to perforation by that projectile has been observed to diminish from that at normal incidence when the incidence is at the lower obliquities, the initial resistance of the subject material was so low that the superiority of Hadfield steel under any condition of attack by these projectiles was impregnable.

3. Samples of Dowmetal (Type J-1) were attached rigidly to wooden ballistic frames and impacted at normal incidence with cal. .45 steel-jacketed ball projectiles and at normal incidence and at obliquities of 20° and 30° from normal with the cal. .22 fragment-simulator. The results appear in Table I.

4. It may be seen that the resistance of these samples which are equivalent in weight to .085" of steel is no better than that of .050" of Hadfield manganese steel. While it may be hazardous, in view of the lack of correlation between the subject tests and actual fragmentation tests, to predict the

1. Report WAL 762/253.

performance of this material under actual service conditions, it is considered that Dowmetal of the type tested (J-1) will not afford sufficient resistance to actual fragments of 20 MM high explosive shell to qualify under Specification AXS-1346[2].

J. F. Sullivan
Asst. Engineer

M. A. Brough
Proof Technician

APPROVED:

E. L. Reed

E. L. REED
Research Metallurgist
Chief, Armor Section

---

2. U. S. Army. Tentative Specification. AXS-1346 (Rev. 1). 18 April 1945. "Armor, Fragment-Resistant; Plate or Sheet; General Specification".

TABLE I

Summary of Ballistic Tests Conducted at Watertown Arsenal Laboratory on Samples of a Magnesium Alloy, Dowmetal (Type J-1)

Sample No.	Actual Gauge	Equivalent Steel Gauge	Obliquity	Ballistic Limit .45[1]	Ballistic Limit .22[2]
J1H7276-1	.376"	.085"	Normal	1001	—
J1H7276-2	.378"	.086"	Normal	—	1588
J1H7276-2	.378"	.086"	20°	—	1635
J1H7276-2	.378"	.086"	30°	—	1723
For Comparison:					
Hadfield Mn Steel		.050"	Normal	1000	1750

1. Cal. .45 steel jacketed ball projectile.

2. Cal. .22 fragment-simulating projectile.