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DODPOPHM/USA/DOD/NADTR91004 REVISION A

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DODPOPHM/USA/DOD/NADTR91004
21 February 1991

**PERFORMANCE ORIENTED PACKAGING TESTING
OF CONTAINER, SHIPPING AND STORAGE, MK 714
FOR PACKING GROUP II SOLID HAZARDOUS MATERIALS**

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DISTRIBUTION STATEMENT A
Approved for public release
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May 1994

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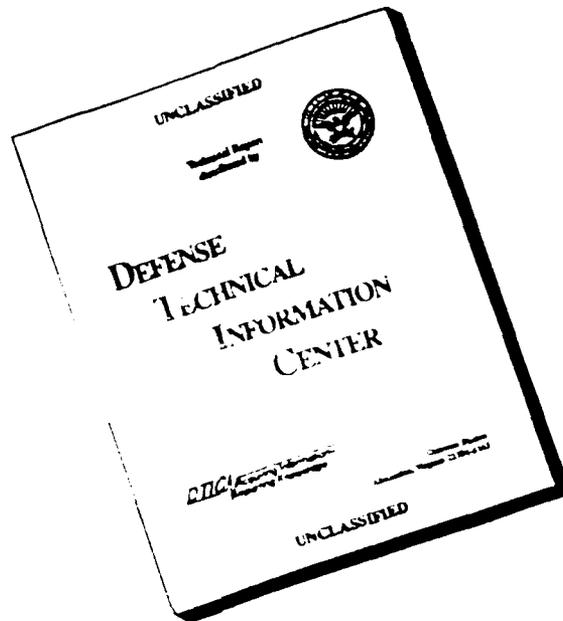
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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 05/94		3. REPORT TYPE AND DATES COVERED POP Test (02/91)	
4. TITLE AND SUBTITLE Performance Oriented Packaging Testing of Container, Shipping and Storage, Mk 714 for Packing Group II Solid Hazardous Materials				5. FUNDING NUMBERS	
6. AUTHOR(S) Milt Meeds					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Undersea Warfare Engineering Station Keyport, Washington 98345-5000				8. PERFORMING ORGANIZATION REPORT NUMBER DODPOPHM/USA/DOD/NADTR91004 REVISION A	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Program Executive Officer Surface Ship ASW Systems (PMO-406) Washington, DC 20362-5104				10. SPONSORING/MONITORING AGENCY REPORT NUMBER Same as above	
11. SUPPLEMENTARY NOTES N/A					
12a. DISTRIBUTION/AVAILABILITY STATEMENT			12b. DISTRIBUTION CODE		
13. ABSTRACT (Maximum 200 words) Qualification tests were performed to determine whether the in-service Mk 714 Mod 0 Shipping and Storage Container could be utilized to contain properly dunnaged solid type hazardous materials weighing up to a gross weight of 545 kg (1,201 pounds). The tests were conducted in accordance with Performance Oriented Packaging (POP) requirements specified by the United Nations Recommendations on the Transportation of Dangerous Goods, ST/SG/AC.10/1. The container has conformed to the POP performance requirements; i.e., the container successfully retained its contents throughout the specified tests.					
14. SUBJECT TERMS POP Test of Mk 714 Shipping and Storage Container				15. NUMBER OF PAGES 23	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		18. SECURITY CLASSIFICATION OF THIS PAGE UL		19. SECURITY CLASSIFICATION OF ABSTRACT UL	20. LIMITATION OF ABSTRACT UL

INTRODUCTION

An EX 714 Shipping and Storage Container that had been modified to the Mk 714 configuration was subjected to tests to determine whether the container would meet international performance requirements. Vibration tests were conducted previously by Naval Weapons Station (WPNSTA) Earle (Test Report 40-050-89 of 11 January 1990). The drop tests were conducted on 7 January 1991 using EX 714 Container S/N 0011 loaded with a Mk 50 Stainless Steel Ballistic Mockup test shape. The test shape was missing the top control fin. The shape was banded with Mk 89 Suspension Bands to simulate an air launch configuration torpedo, but a parapak was not available for installation. Total test shape weight was 776 pounds. All drops were conducted on concrete from a minimum height of 4 feet. The shipping container was opened following each drop to inspect the torpedo mounting hardware for damage. Enclosure (1) contains photographs of test setups of each drop and container and test shape damage following each drop.

TESTS PERFORMED

1. Stacking Test

This test was performed in accordance with United Nations Recommendations on the Transportation of Dangerous Goods Document, ST/SG/AC.10/1, chapter 9, paragraph 9.7.6. Three containers were used for this test. Each container was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a height of 3 meters (10 feet), including the test sample. A weight of 2,313 kg (5,100 pounds) was stacked on each of the three containers. The test was performed for 24 hours. After the allowed time, the weight was removed and the containers examined.

2. Drop Test

These tests were performed in accordance with United Nations Recommendation on the Transportation of Dangerous Goods Document, ST/SO/AC.10/1, Revision 6, Chapter 9, paragraph 9.7.3. One container was used for all of the drops instead of the required five containers (one for each drop). The drops were performed at ambient temperature (70 ± 20 °F) from a height of 4 feet onto concrete in the following sequence:

- a. Flat bottom.
- b. Flat long side.
- c. Flat on short side.
- d. Aft end bottom corner.
- e. Flat on top.

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DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

PASS/FAIL

1. Stacking Test

The criteria for passing the stacking test is outlined in paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength, cause instability in stacks of packages, or cause damage to inner packagings likely to reduce safety in transportation.

2. Drop Test

The criteria for passing the drop test is outlined in of paragraph 9.7.3.5 of ST/SO/AC.10/1 and states the following: The shape must be retained within the container by the saddle straps, and the container must exhibit no damage liable to affect safety during transport.

TEST RESULTS

1. Stacking Test

Satisfactory.

2. Drop Test

a. **Drop on Bottom.** No visible external or internal damage.

b. **Drop on Long Side.** Lift eyes on the impacting side of the container were taped to the container wall to prevent damage. Following impact there was no visible external or internal damage.

c. **Drop on Short Side (End).** The container impacted on the fwd end and then rolled over onto the ocntainer cover. During impact, one of the cover latches popped open (Photograph A), and the fwd end was bent in approximately 1 to 1.5 inches (Photographs B and C). On opening the container, both aft saddle strap latches were broken free (Photographs D and E) and one fwd saddle strap latch was broken at the retaining pin (Photographs F and G). The test shape was held in place by the remaining fwd saddle strap latch. Test shape damage was limited to the aft suspension band wedge which popped free (Photograph H), partially releasing the suspension band. The suspension band remained securely attached to the test shape by the safety bolt. Container cover damage and test shape fin damage may have occurred if the top control fin had been installed.

NOTE

The aft suspension band wedge was removed and both saddle straps were replaced prior to continuing with the tests.

d. **Drop on Corner.** The container impacted on an aft end bottom corner and then landed upright on the container base. Two cover latches at the impact corner popped open and the container base at the impact point was damaged (Photographs I and J). On opening the container, both fwd saddle strap latches were broken at the retaining pins (Photographs K and L). There was no visible damage to the test shape.

NOTE

The fwd saddle strap was replaced prior to continuing the tests.

e. **Drop on Top.** Following impact, all container cover latches remained securely fastened. The container was damaged due to impact from the test shape suspension bands (Photograph M). On opening the container, the desiccant basket had broken free from the container cover and was found next to the test shape (Photograph N). The saddle strap latches appeared to receive minimal to no damage. The test shape was held securely in the saddles during the test, but cover damage was caused by motion allowed by the rubber isolators. Test shape damage was limited to the suspension band lugs and the remaining wedge which popped free, partially releasing the suspension band. Both suspension bands remained securely attached to the test shape by the safety bolts.

NOTE

Additional cover damage and test shape fin damage may have occurred if the top control fin had been installed on the test shape. The desiccant basket may have suffered damage during the previous tests before failing here.

DISCUSSION

1. Stacking Test

The container was visibly checked after the 24-hour period was over. No unfavorable distortion or deterioration was observed.

2. Drop Test

The container met all criteria for passing the test. The test shape was held in the container by the saddle straps, and the container exhibited no damage liable to affect safety during transport.

REFERENCE MATERIAL

A. United Nation's "Recommendation on the Transportation of Dangerous Goods," ST/SG/AC.10/1, Revision 6.

B. DOD Hazardous Materials Packaging Test Plan (Attachment 1)

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TEST DATA SHEET

DATA SHEET:	
Container: Container, Shipping and Storage Container, Mk 714	
Type: 4B1	Container P/N or NSN: P/N 5167617
Specification Number: Drawing DL 5167617	Material: Aluminum
Gross Weight: 545 kg (1,201 pounds)	Dimensions: 137" L x 23.03" W x 24.375" H
Closure (Method/Type): Removable Lid	Tare Weight: 193 kg (425 pounds)
Additional Description: Reusable extruded aluminum shipping and storage container with a removable cover	
PRODUCT:	
Name: See table 1	NSN(s): See table 1
United Nations Number: See table 1	
United Nations Packing Group: II	
Physical State (Solid, Liquid, or Gas): Solid	
Vapor Pressure (Liquids Only): N/A At 50 °C: N/A At 55 °C: N/A	
Consistency/Viscosity: N/A	Density/Specific Gravity: N/A
Amount Per Container:	Flash Point: N/A
Net Weight: See table 1	
TEST PRODUCT:	
Name: Stainless Steel Ballistic Mockup	Physical State: Solid
Consistency: N/A	
Density/Specific Gravity: N/A	
Test Pressure (Liquids Only): N/A	
Amount Per Container: One	Net Weight: 352 kg (776 pounds)

TABLE 1
Products Approved for Shipping in the
Mk 714 Shipping and Storage Container

NALC	NSN	Name and Drawing #	DOD Hazard/Class Compatibility Group	UN ID	Net Weight (pounds)
1685	1356-01-273-1245	Mk 50 Torpedo Exercise 5624425-10 Tube Launched	1.4S	0173	702
1687	1356-01-273-1246	Mk 50 Torpedo Exercise 5624425-11 Fixed Wing	1.4S	0173	721
1689	1356-01-273-1247	Mk 50 Torpedo Exercise 5624425-12 Rotary	1.4S	0173	722

PHOTOGRAPHS OF CONTAINER
AND TEST SHAPE DAMAGE

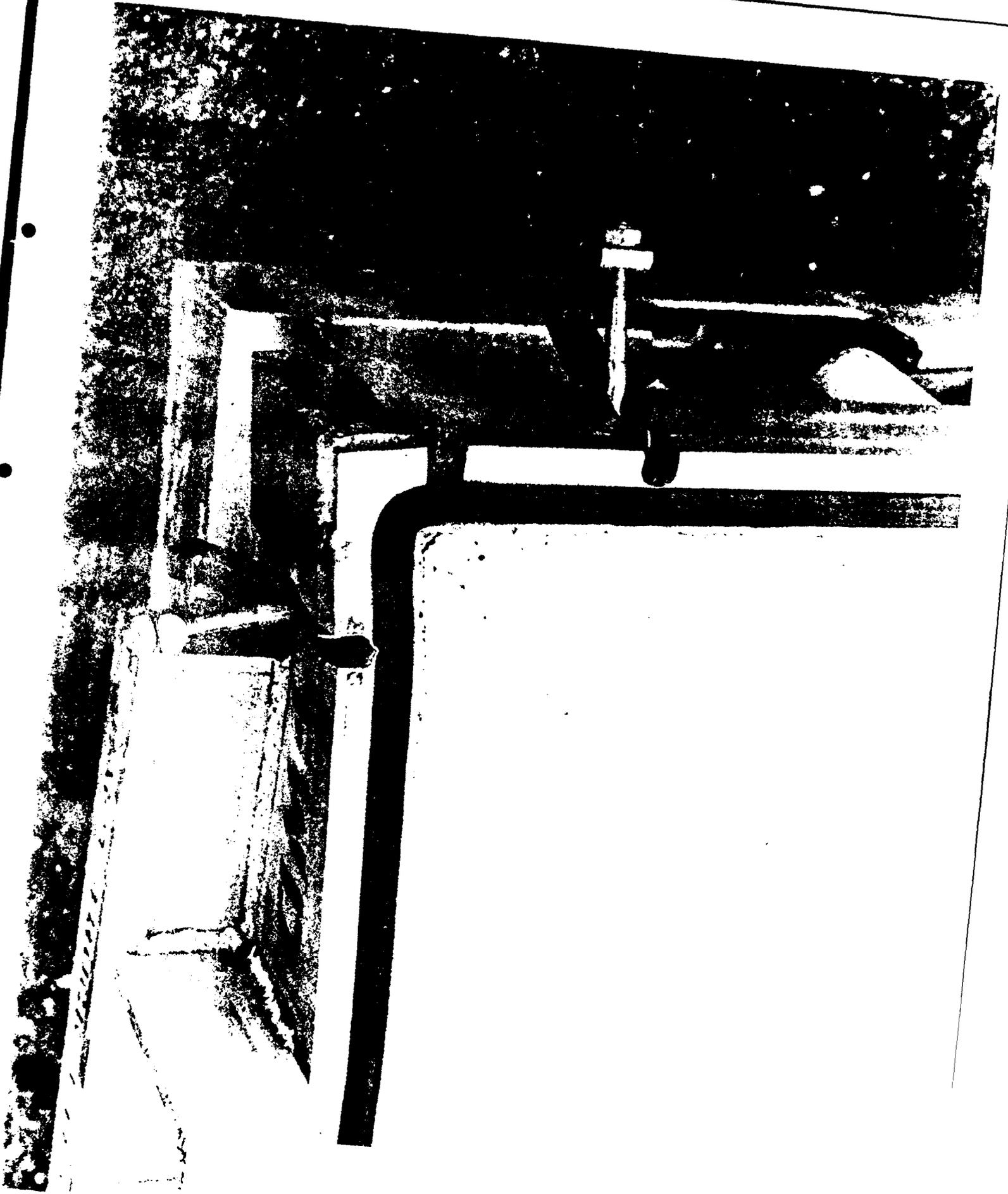
Enclosure (1)

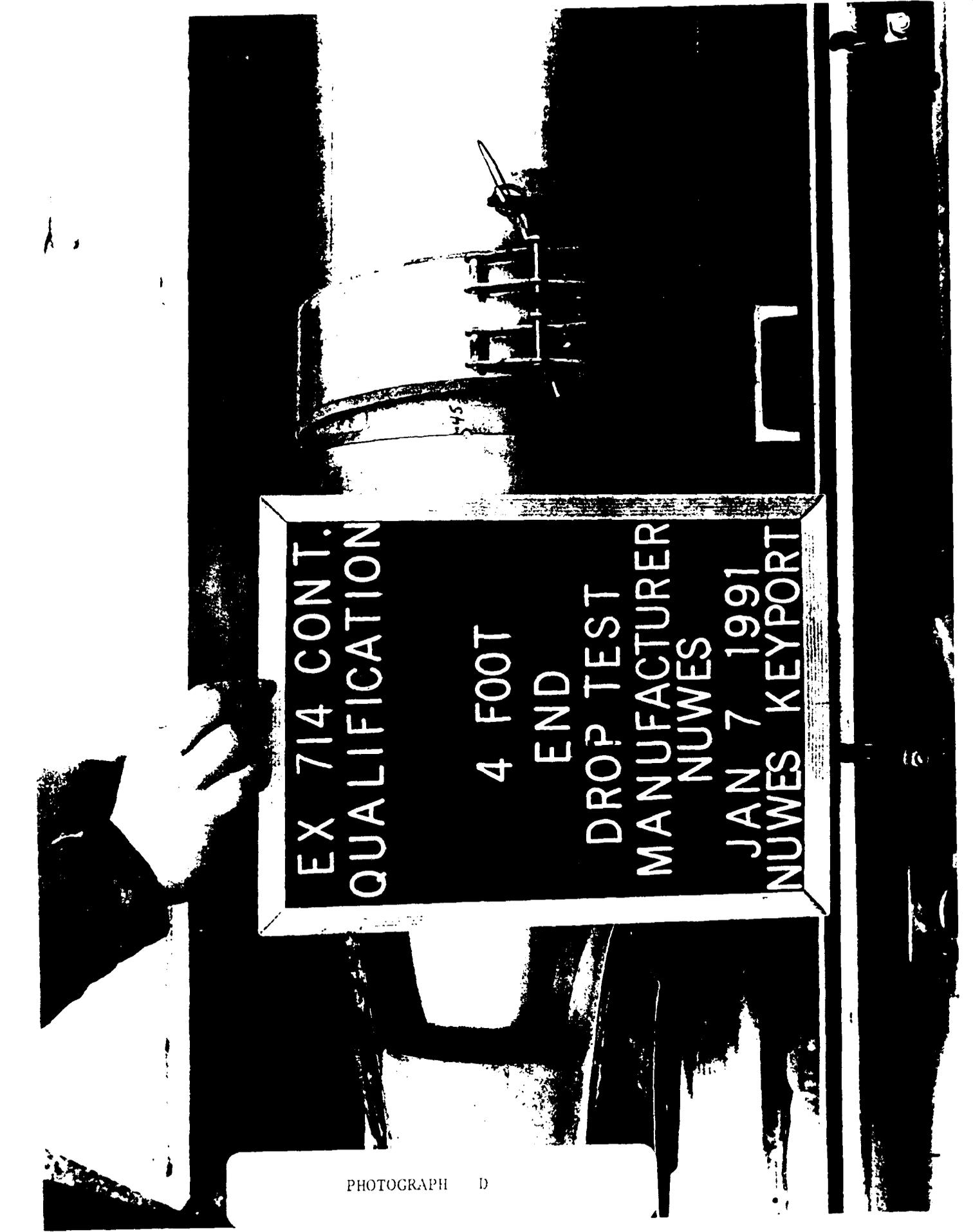


PHOTOGRAPH A



PHOTOGRAPH B





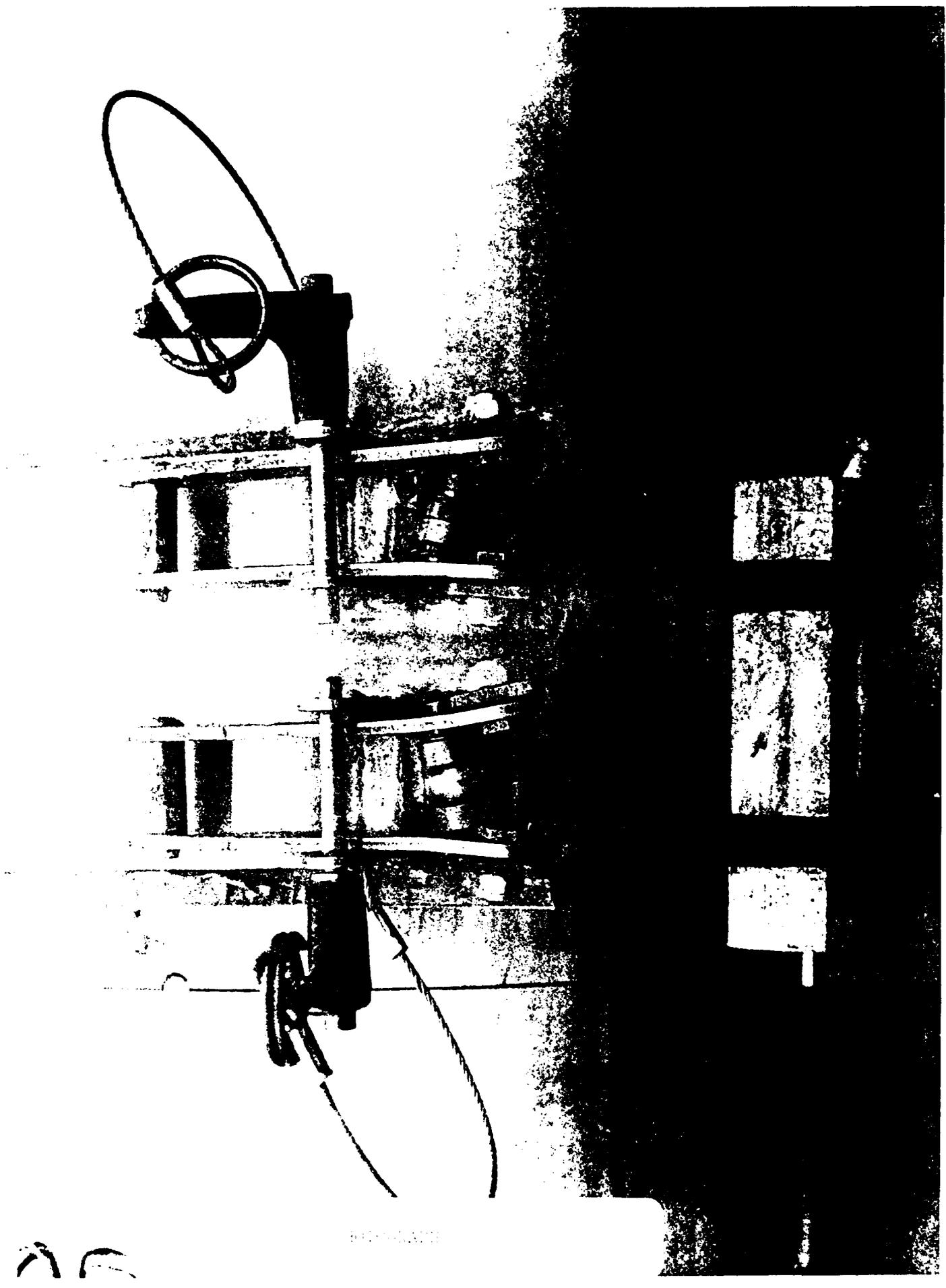
EX 714 CONT.
QUALIFICATION

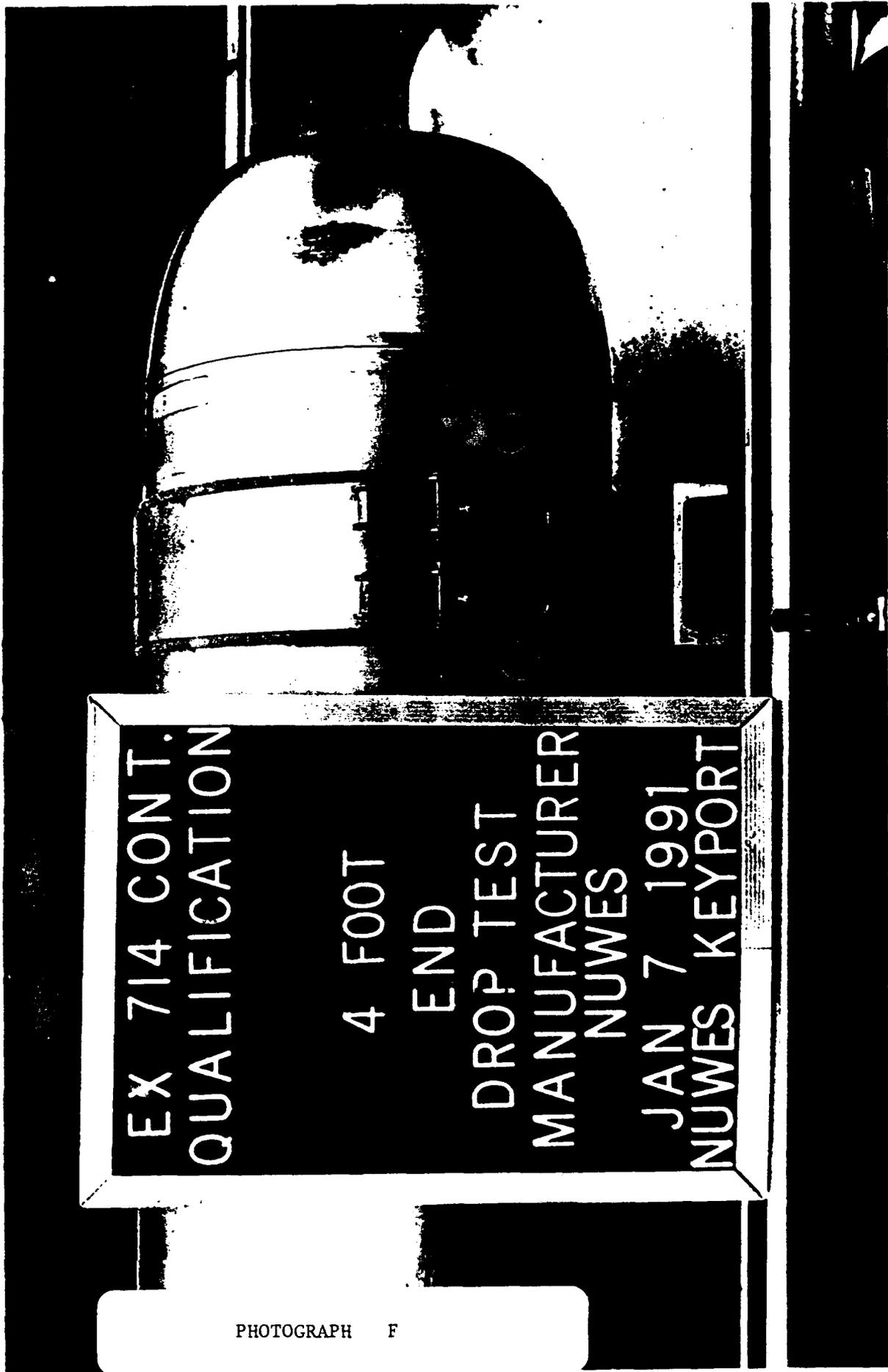
4 FOOT

END

DROP TEST
MANUFACTURER
NUWES

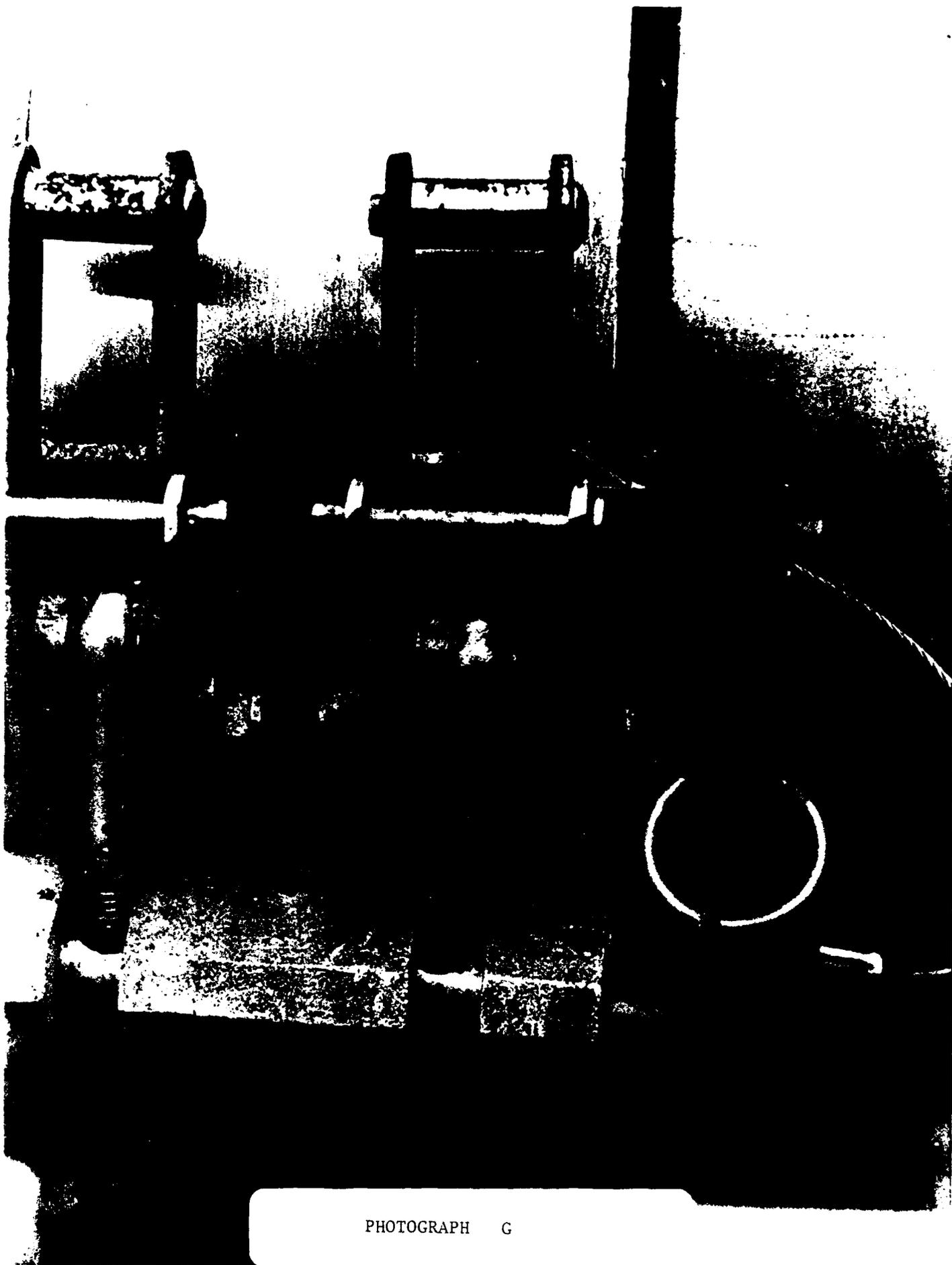
JAN 7 1991
NUWES KEYPORT



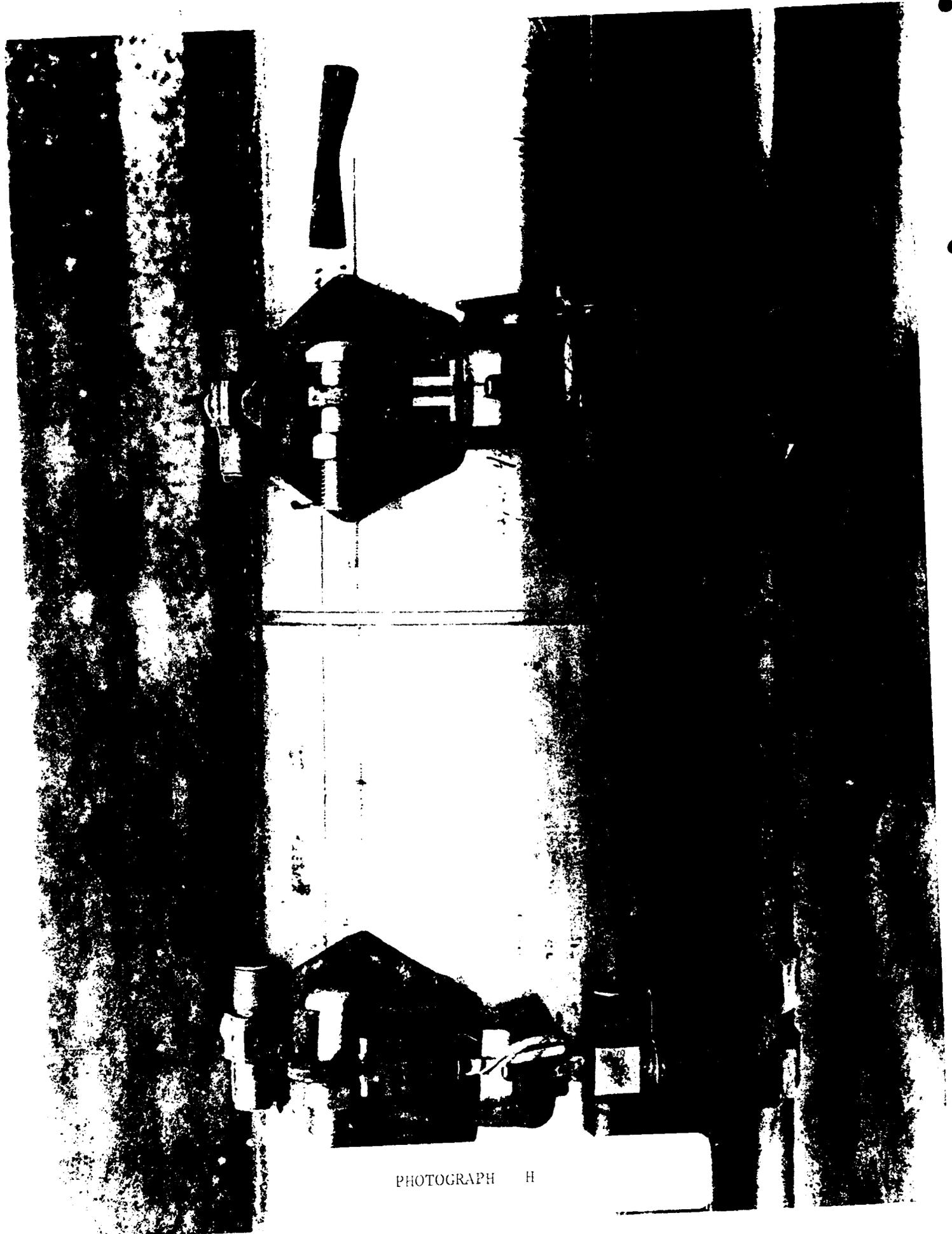


EX 714 CONT.
 QUALIFICATION
 4 FOOT
 END
 DROP TEST
 MANUFACTURER
 NUWES
 JAN 7 1991
 NUWES KEYPORT

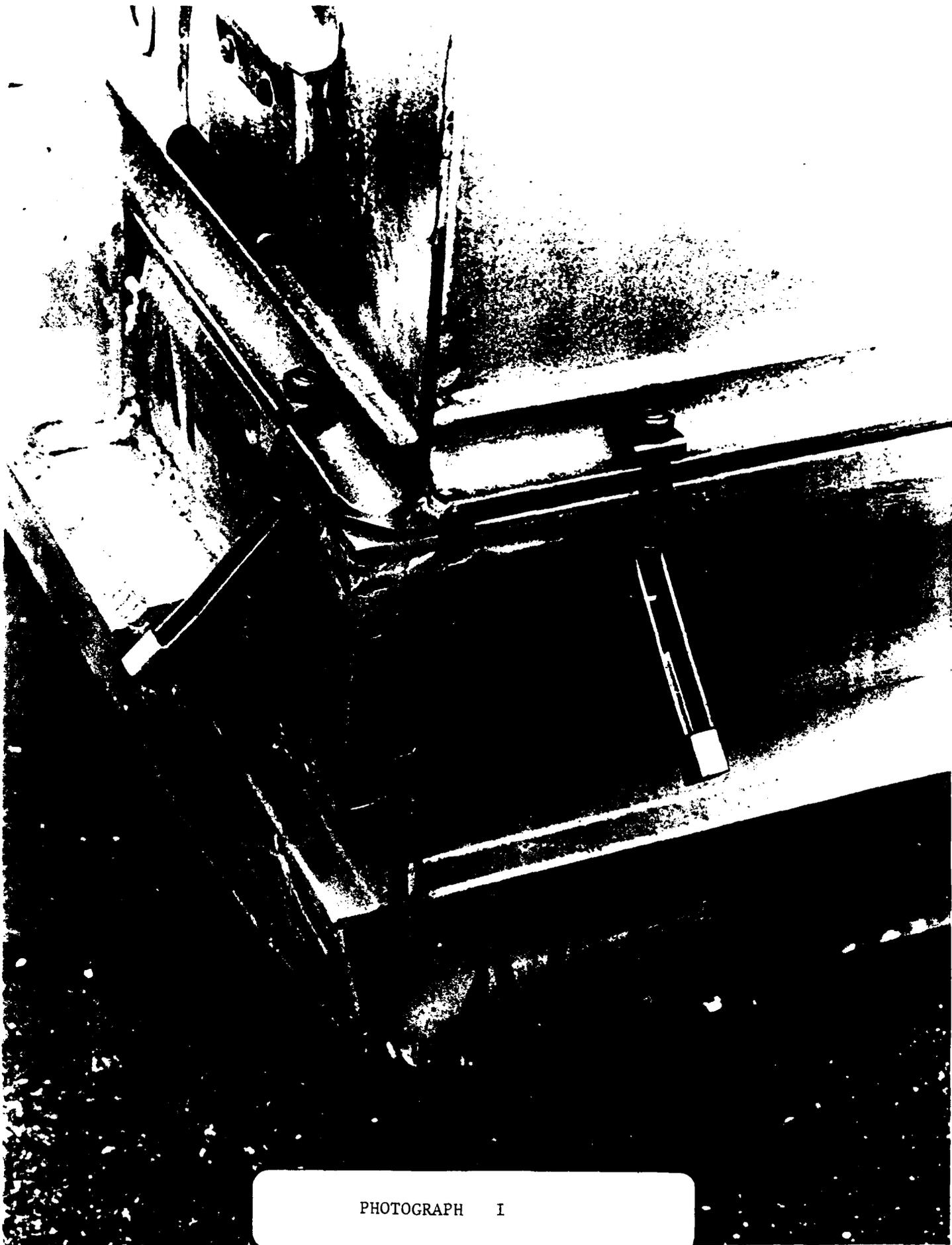
PHOTOGRAPH F



PHOTOGRAPH G



PHOTOGRAPH H



PHOTOGRAPH I



PHOTOGRAPH J

END

REUSABLE CONTAINER

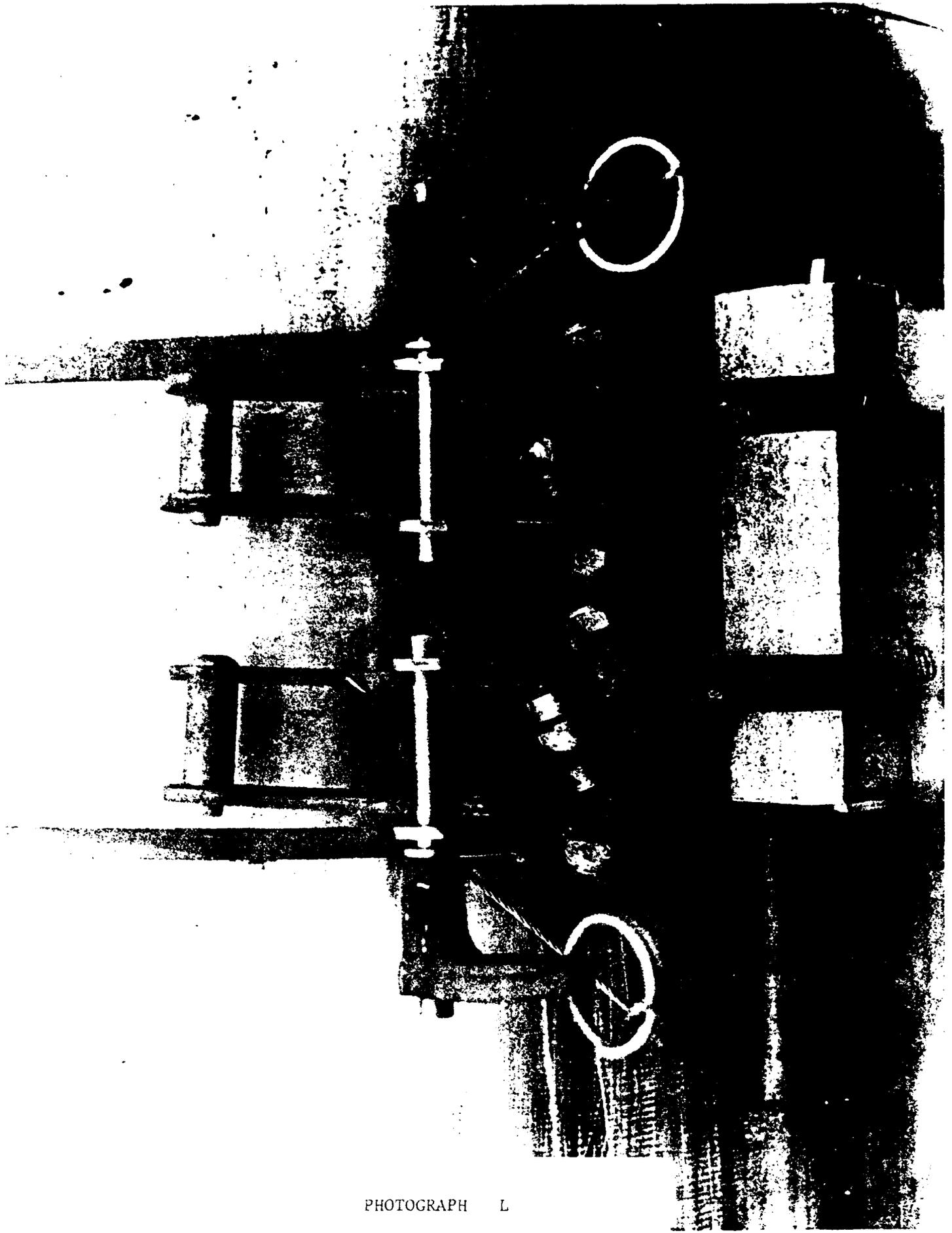
EX 714 CONT.
QUALIFICATION

4 FOOT

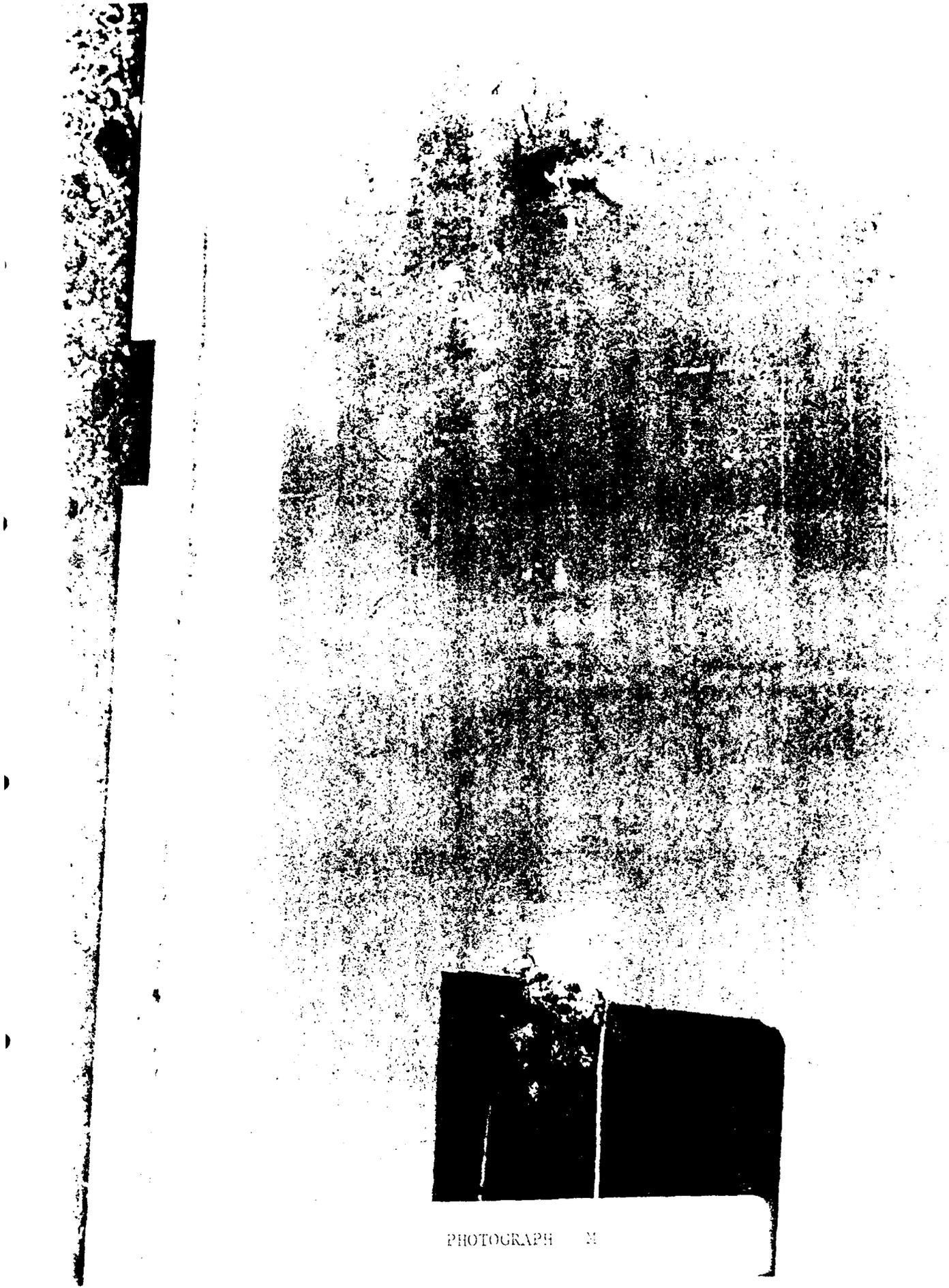
CORNER
DROP TEST
MANUFACTURER
NUWES

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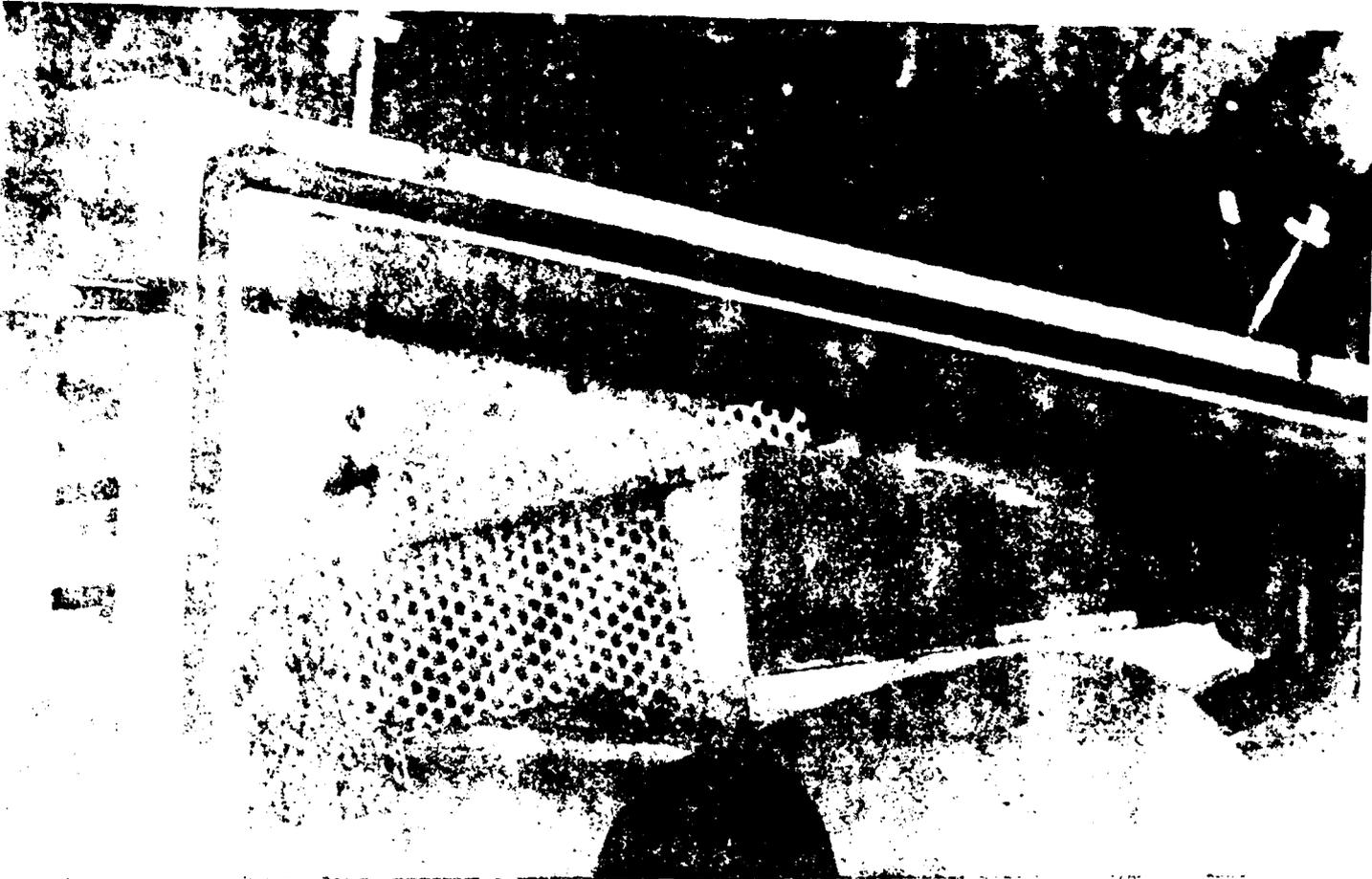
PHOTOGRAPH K



PHOTOGRAPH L



PHOTOGRAPH M



EX 714 CONT.
QUALIFICATION
4 FOOT
TOP
DROPPESST
MANUFACTURER
ADVISOR
FURTHER
INFORMATION

MK 714
SHIPPING AND STORAGE CONTAINER
POP MARKING

UN 4B1/Y545/S//USA/DOD/NAD**

**** YEAR LAST PACKED OR MANUFACTURED**

Encl (2)