



DEPARTMENT OF THE ARMY  
HEADQUARTERS, U.S. ARMY INDUSTRIAL OPERATIONS COMMAND  
ROCK ISLAND, ILLINOIS 61299-6000



REPLY TO  
ATTENTION OF

January 8, 1997

Deputy Chief of Staff for  
Industrial Risk Management

10 CFR 20.2201  
(6)  
144  
12-00722-07  
03014796

Regional Administrator  
U.S. Nuclear Regulatory Commission  
Nuclear Materials Safety Branch Two  
Region III  
801 Warrenville Road  
Lisle, Illinois 60532-4351

Dear Sir:

This letter is the followup report to the telephonic notification made to the Nuclear Regulatory Commission Operations Center by Mr. Kelly Crooks of our Radioactive Waste Disposal Division on December 9, 1996. The notification informed the Nuclear Regulatory Commission of the loss of Promethium-147 contained in light antitank weapon rocket sights at Fort Bragg, Fayetteville, North Carolina. Mr. Crooks also notified Mr. Loren Hueter, Nuclear Regulatory Commission, Region III, of the loss. License number BML 12-00722-07, issued to this Command by NRC Region III, covers the Promethium-147.

An Army cleanup of an incident in 1990 at Fort Bragg resulted in a soil pile containing light antitank weapon rocket debris. Fort Bragg secured the soil pile in place for decay. We anticipated release of the soil pile in 1999. We believe military personnel leveled the soil pile containing the light antitank weapon rocket sight debris in 1993, spread it out, and covered the material with crushed rock. Evidence indicates the soil pile is near its original location. The Army is continuing its investigation into the exact circumstances involving removal of the pile.

We enclose the written report of findings and our recommendation of no action for recovery of the material for your review.

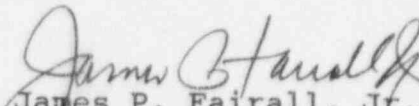
9702060018 970108  
PDR ADCK 03014796  
C PDR

JAN 09 1997

1/1 IE-72

The points of contact are Mr. Kelly Crooks and Mr. Gary Buckrop, AMSIO-DMW, (309) 782-0338 and (309) 782-2969 respectively, electronic mail addresses kcrooks@ria-emh2.army.mil and gbuckrop@ria-emh2.army.mil respectively.

Sincerely,

  
James P. Fairall, Jr.  
Colonel, U.S. Army  
Chief of Staff

Enclosure

Copies Furnished:

Commander, U.S. Army Materiel Command, Attention:  
AMCSF-P, 5001 Eisenhower Avenue, Alexandria,  
Virginia 22333-0001  
Commander, SVIII Airborne Corps and Fort Bragg,  
Attention: AFZA-SA/Mr. Jim Adams, Fort Bragg,  
North Carolina 28307-5000  
Commander, U.S. Army Forces Command, Attention:  
AFPI-SO/Mr. Lynn Clements, Fort McPherson,  
Georgia 30330-6000

**LOSS OF PROMETHIUM-147  
LIGHT ANTITANK WEAPON (LAW) ROCKET SIGHT DEBRIS IN SOIL PILE  
FORT BRAGG, NC**

This report lists the information required per Title 10, Code of Federal Regulations, part 20.2201(b), for loss of licensed radioactive material.

**DESCRIPTION OF LICENSED MATERIAL.** The Radioactive Waste Disposal Division manages license number BML 12-00722-07 for the U.S. Army Industrial Operations Command (IOC). The license authorizes the possession and use of Promethium-147 (Pm-147) in the front aiming sight of the M72A1 and M72A2 LAW rocket systems. These front sights contained 3 mCi each of Pm-147 upon manufacture in the 1970s. Ceramic microspheres that are in paint laminated into the plastic sight contain the Pm-147. These plastic sights are slightly smaller than an ordinary credit card. We provide drawings of the LAW rocket system and the front aiming sight at enclosure 1.

As part of a remedial action from a LAW sight incident in 1990, the top 6-18 inches of soil in a former residue yard within the Fort Bragg Ammunition Supply Point (ASP) were scraped into a pile. The pile measured approximately 35' x 50' x 10' (17,500 cubic feet). We have enclosed a map (encl 2) of the Fort Bragg ASP showing the location of the former residue yard. The former residue yard is now an ammunition storage area for a Deployment Readiness Brigade (DRB). We have enclosed a map (encl 3) of the DRB area indicating the original location of the soil pile.

License amendment 18 (enclosure 4), dated 29 November 1993, required the Army to secure and monitor the pile until release due to decay in 1999. The Army plan was to fence, post, visually inspect, and take annual soil samples of the area until release. After release, the Army plan is to dispose of the pile at the Fort Bragg construction landfill.

**DESCRIPTION OF CIRCUMSTANCES UNDER WHICH THE LOSS OCCURRED.**

In December 1996, representatives of the licensee performed an inspection at Fort Bragg. We documented and investigated the disappearance of the soil pile. The current Fort Bragg Radiation Protection Officer (RPO), Mr. Will Evans, said that someone had released the pile during construction of the nearby ammunition storage area for the DRB in the summer of 1993.

Mr. Evans did not know how Fort Bragg released the pile. Fort Bragg has not found the release document and the Fort Bragg RPO at the time, Mr. John Vereen, cannot recall who sent it. Based on statements from Fort Bragg personnel and evidence found on site, our understanding of the sequence of events is:

*Enclosure*

o October 1990 - March 1991. Fort Bragg discovered the improper disposal of LAW launcher tubes; the Army Environmental Hygiene Agency performed a radiological survey of the area; the Army created the soil pile; and the Army requested approval from the Nuclear Regulatory Commission to secure the soil pile in place prior to release.

o March 1991 - October 1992. Fort Bragg put a security fence (angle iron and barbed wire) around the pile and posted the fence with "Caution Radioactive Materials" signs. The U.S. Geological Survey completed an environmental assessment stating that the effected ASP area is below radiological screening levels.

o June 1993. The licensee (at the time, the licensee was named the U.S. Army Armament, Munitions and Chemical Command which was subsequently reorganized into the IOC in 1995), inspected the site, made recommendations on replacing faded caution signs, and emphasized that Fort Bragg not use the pile in the on-going construction of the DRB earthen berm. Fort Bragg replaced the signs immediately. The soil was not used as fill for the berm.

o July - August 1993. Note: **None of the military personnel who were on site at Fort Bragg in 1993 are still there. We are making some assumptions based on conversations with civilian personnel familiar with the site at that time.** The 20th Engineering Brigade wanted to move the soil pile to complete their construction of the DRB ammunition storage area. We assume the 20th Engineering Brigade wanted the soil pile moved because it was in the way of the heavy equipment, it would be in the way of trucks dropping off and picking up ammunition, and it was an eyesore. The RPO would not release the pile, so the 20th Engineering Brigade contacted an outside agency to release the potentially contaminated soil pile. Neither the 20th Engineering Brigade nor the outside agency was familiar with the NRC license requirements.

o July - August 1993. According to Mr. Vereen, an off-post civilian agency took soil samples from the pile. This agency sent a letter to the 20th Engineering Brigade with the sample results which showed no contamination. The 20th Engineering Brigade then sent a copy of the letter to Mr. Vereen and, at this point, both the 20th Engineering Brigade and Mr. Vereen considered the pile free released.

o August - October 1993. The 20th Engineering Brigade completed the major portion of the DRB construction project (the earthen berm and storage sheds) and prepared the traffic area for a crushed rock cover. Since the 20th Engineering Brigade considered the soil to be clean, they flattened the soil pile

while leveling the entire traffic area. The 20th Engineering Brigade spread out the pile in the immediate area and covered it with about 6 inches of crushed rock.

o November 1993. The NRC, Region III, issued amendment 18. The amendment allowed the Army to secure the pile in place and monitor it via visual inspections and annual soil sampling until 1999, when the Pm-147 would have decayed to minute levels. Then the Army would terminate the amendment and release the pile.

o December 1993. The licensee forwarded amendment 18 to Fort Bragg (enclosure 5). In this letter, the licensee requested Fort Bragg perform the on-site monitoring and maintain records.

o February 1994. Mr. Vereen departed for Kuwait. He said he did not see amendment 18 before he left, so he did not know of its requirements. Mr. Vereen did not know that the NRC and the licensee had to release the pile. Without seeing the amendment, he did not call the licensee to question the release. In the transition, his replacement, Mr. Evans, was also unaware of the requirement to monitor the pile.

o November 1994. Control of the Fort Bragg ASP, which contains the soil pile area, transferred from a military organization to a civilian organization.

o 3-5 December 1996. The licensee performed a license inspection at Fort Bragg, documented and investigated the disappearance of the soil pile, took soil samples in the affected area, and interviewed personnel. We have enclosed soil sample locations at enclosure 6. Fort Bragg could not find the release document or conclusively show when and where they had moved the pile.

o 16-19 December 1996. The licensee returned to Fort Bragg to search for the pile. We interviewed Mr. Derek Cornette, a former Chem-Nuclear Systems, Inc., employee who managed the clean up of the ASP yard in 1991 before the trip. According to Mr. Cornette, the cleanup crew had removed all big pieces of rocket debris through dozens of walk overs of the area and probably only small (less than one-half inch) pieces of the plastic sights remained. He also thought only a handful of Pm-147 LAW rocket sights could have been in the soil pile, as many of the plastic sights were from nonradioactive Redeye Rockets or the M72A3 non-radioactive version of the LAW rocket, so the chance of finding radioactive LAW rocket sight debris was small. As seen in the photographs at enclosure 7, we searched for visible evidence of the debris by digging holes with hand tools and a backhoe, and walking over the areas of potential placement of the pile and runoff. We also took water and soil samples at the locations shown at enclosure 8. We found pieces



of barbed wire, probably from the security fence, at the original pile site and about 50-feet south sticking out of the crushed rock. We also found pieces of one of the radioactive materials caution signs in the grassy runoff area north of the pile site.

o Ongoing. Fort Bragg has begun a formal internal investigation according to AR 15-6, 11 May 1988, Procedure for Investigating Officers and Boards of Officers, to determine exactly what happened to the pile. They are attempting to locate the persons who ordered the pile moved and who operated the equipment.

#### **STATEMENT OF DISPOSITION OF THE LICENSED RADIOACTIVE MATERIAL.**

Although we did not find actual LAW rocket sight debris, we strongly feel Fort Bragg leveled the soil pile in preparation for the crushed rock cover of the traffic area. The 20th Engineering Brigade spread the pile around its original location in the DRB traffic area and covered it with about 6 inches of crushed rock. Our reasoning is based on:

o Time. Different people stated the 20th Engineering Brigade moved the pile after, or very close to, completion of the DRB berm and shelters, but prior to completion of the crushed rock cover so the engineers did not use it for the fill in the berm. Those interviewed also felt there was a sense of urgency to complete the rock cover. We believe once the engineers had written documentation the pile was clean, they considered it released and leveled it while preparing the entire traffic area for a crushed rock cover.

o Equipment on Site. At the time the 20th Engineering Brigade moved the pile, the hauling equipment, trucks, and end loaders had left the site. Mr. Vereen stated that only bulldozers and road graders were on site to level the area and smooth the crushed rock cover. So the engineers did not remove the pile from the site.

o Search of Area. Our on-site search found debris from the security fence. Two pieces of barbed wire were in the traffic area, one on the crushed rock surface at the original pile site, and the other sticking out of the crushed rock about 50 feet from the original site. Pieces of one of the "Caution Radioactive Materials" signs were on the surface of the grassy runoff area about 100 feet from the traffic area. Numerous small caliber ammunition components were found. We believe the engineers knocked down the fence, recovered the posts, most of the wire and the signs for disposition as scrap or waste, but in the process broke off pieces of wire and shredded one of the caution signs.

**EXPOSURES OF INDIVIDUALS TO RADIATION.** The ASP is a secure area. Those individuals granted access do not spend much time there. The only individuals potentially exposed were the engineers operating the heavy equipment and walking the site in 1993. The Pm-147, as a low-energy beta emitter, is not an external hazard, and the configuration of the Pm-147 (microspheres in paint laminated in plastic) prevented release of the material for ingestion or inhalation. Thus, the Pm-147 did not expose workers to radiation.

The Army Environmental Hygiene Agency performed two on-site surveys in 1991 as a result of the original 1990 LAW rocket sight incident. The Army Environmental Hygiene Agency published the report for these surveys in May 1992. The report indicates no apparent health hazards or environmental danger with respect to the effected areas.

The U.S. Geological Survey completed an Environmental Assessment of the affected areas and published their report in October 1992. This report states ". . . the gross alpha and beta-particle activity levels do not exceed U.S. Environmental Protection Agency regulatory limits or screening levels for the state of North Carolina."

Results received to date of soil sampling performed in December 1996 show no radiological contamination.

The current risk assessment at enclosure 9 shows there is no substantial risk of radiation exposure to current on-site workers or the public off site.

**ACTIONS TAKEN TO RECOVER THE MATERIAL.** We believe the cost to remediate the site to recover the soil pile exceeds the benefit gained from its removal, and we propose a course of no action for recovery of the material.

o Hazard. The risk assessment shows the radiological hazard to on-site and off-site personnel is minute. The principal hazards to personnel from site remediation, exposure to possible unexploded ordnance, operation of heavy equipment, and shipment of several trucks from Fort Bragg, NC, to Clive, UT, exceed the radiological hazards from leaving the material on site. The current maximum activity per LAW rocket sight is about 15 uCi (the original activity was 3 mCi per sight, the half-life of Pm-147 is 2.62 years, and the date of last manufacture was 1977).

o Site Security. Unauthorized personnel do not have access to the site. The site is within Fort Bragg's ASP, which stores bulk quantities of all types of ammunition and has the appropriate security measures. A security fence with guards encloses the ASP. Surveillance cameras monitor the DRB area within the ASP.

o Cost to Remediate. Our estimated cost to remove, package, transport, and dispose of the soil pile is approximately \$690,000. We have enclosed a written estimate with our assumptions at enclosure 10.

**PROCEDURES OR MEASURES ADOPTED TO ENSURE AGAINST RECURRENCE.**

Although the Army does not have any other outstanding issues similar to the soil pile situation at Fort Bragg, we will adopt the following measures:

o The licensee has written a formal memorandum on the control of licensed material and is in the process of distributing it to all LAW rocket storage and using installations. This memorandum states that users must remove the front sight of LAW rocket systems and dispose of them properly. Additionally, the installation must contact the licensee before they adopt new or unusual procedures.

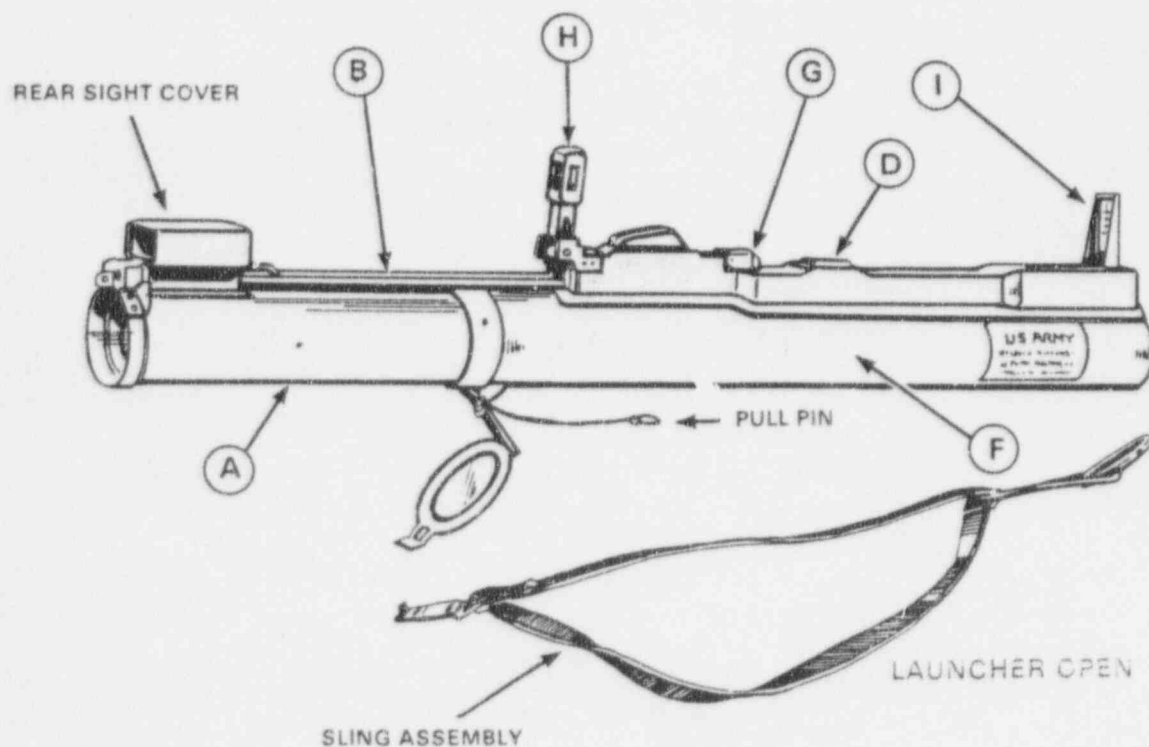
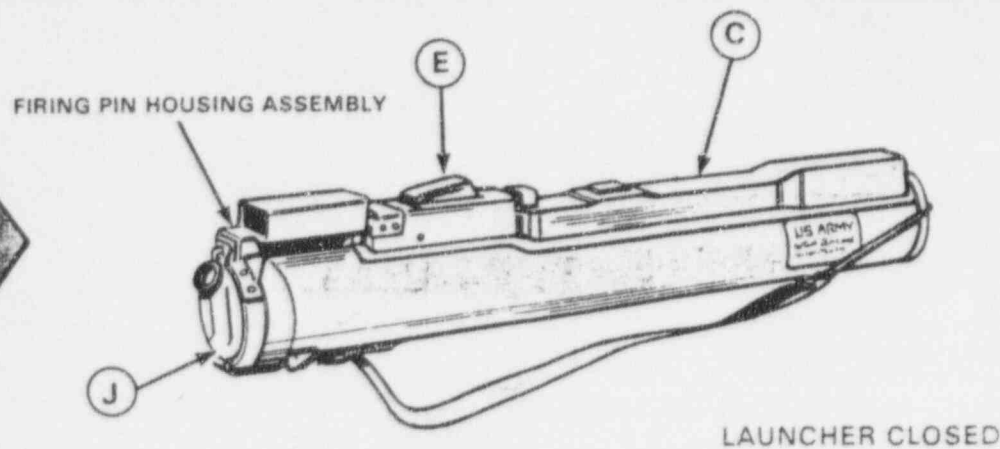
o The IOC will write "Memorandums of Understanding" with other affected military organizations that formalize responsibilities for "out-of-the-ordinary" license situations.

o The IOC will shift the focus of on-site audits from bulk storage installations to installations that fire LAW rockets.

o The licensee will include LAW rocket license training in an already existing Army radiation safety course.

10 Encls  
as



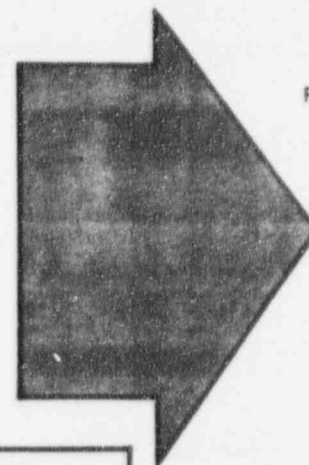


## Section II.

### DESCRIPTION AND TABULATED DATA

#### DESCRIPTION

**LAUNCHER.** The launcher is made of two tubes; one fits inside the other. The inner tube (A) is guided by a channel assembly (B), which rides in an alignment slot in the trigger housing assembly (C). It will extend telescopically along the channel assembly (B), which houses the firing pin rod assembly and locks the launcher in the extended position through the detent lever assembly (D). The firing pin rod assembly locks under the trigger assembly (E) and cocks the weapon when the launcher is extended. The outer tube (F) has the following parts affixed to it: the trigger housing assembly (C) located on the upper surface, trigger assembly (E), trigger arming handle (G), rear sight assembly (H), front sight assembly (I), and rear cover (J).



FIRING PIN H



SEE CHAPTER 3  
ROCKET  
AMMUNITION

**ROCKET.** The rocket consists of a 66-mm HEAT warhead, a point-initiating-base detonating fuze, and a rocket motor. Attached to the rear of the rocket motor are six spring-loaded fins which are folded forward along the motor when the rocket is in the launcher. When ignited, the propellant in the rocket motor burns and builds up gas pressure. The gas pressure moves the rocket to the target.

REAR SIGHT COV

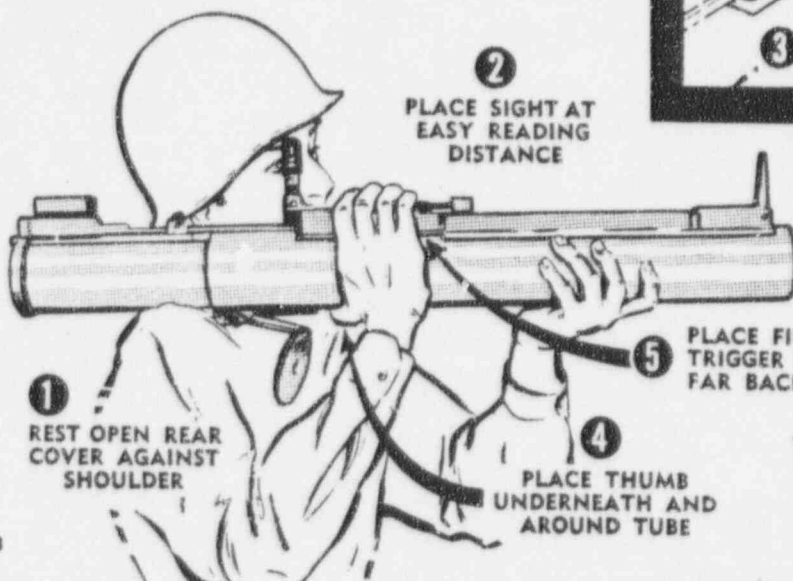


#### TABULATED DATA

LAUNCHER	M72A2	M72A1
LENGTH (FIRING POSITION)	89.3 CM (35.16 IN)	89.3 CM
LENGTH (CLOSED POSITION)	65.6 CM (25.77 IN)	65.6 CM
WEIGHT (COMPLETE SYSTEM)	2.36 KG (5.2 LB)	2.13 KG
WEIGHT (LAUNCHER ONLY)	1.36 KG (3.0 LB)	1.13 KG
FIRING MECHANISM	PERCUSSION	PERCUSSION
SIGHTS (BOTH MODELS)	FRONT	RETICLE GRADUATED IN 25-METER RANGE INCREMENTS.
	REAR	PEEPSIGHT WHICH ADJUSTS AUTOMATICALLY TO TEMPERATURE CHANGE.



## READY

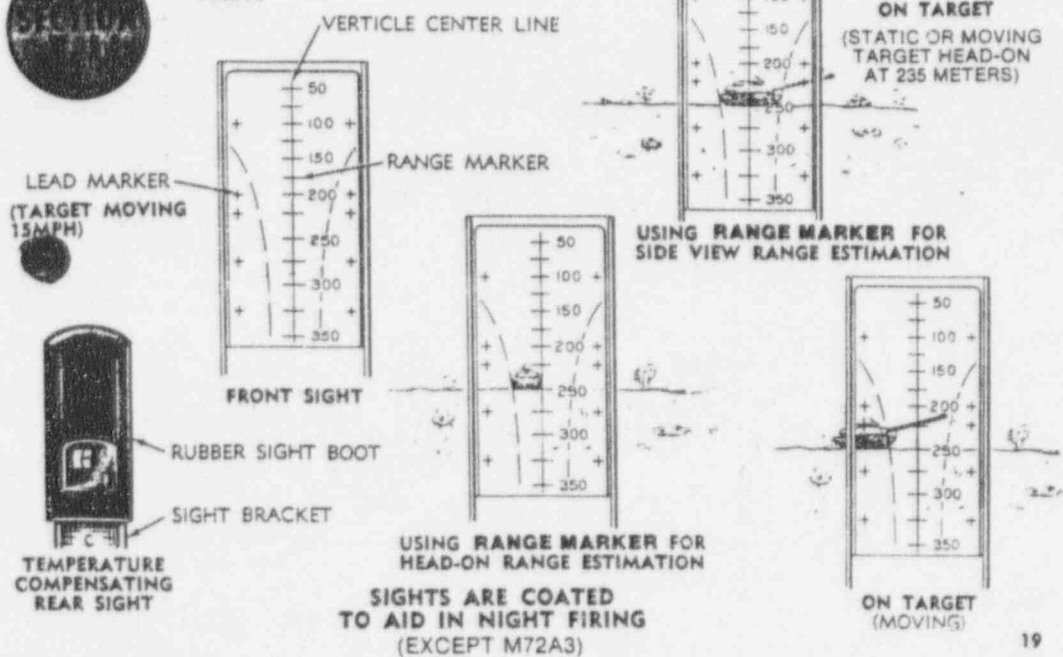


**TARGET**  
→

18



## AIM



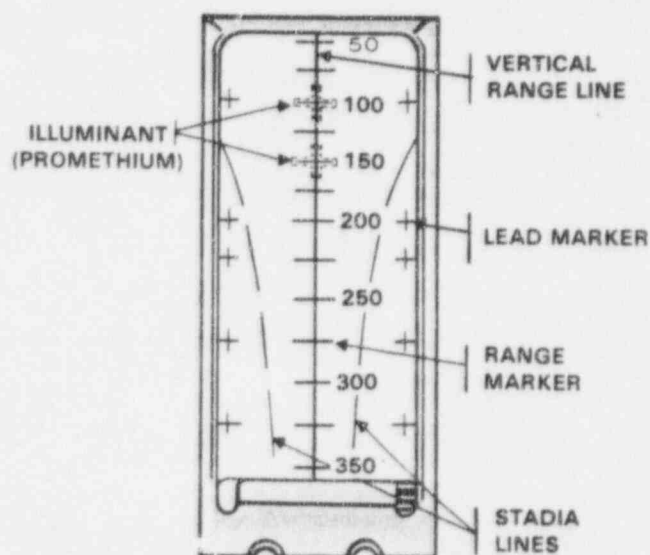
19

## Section II. SIGHTS

### FRONT SIGHT

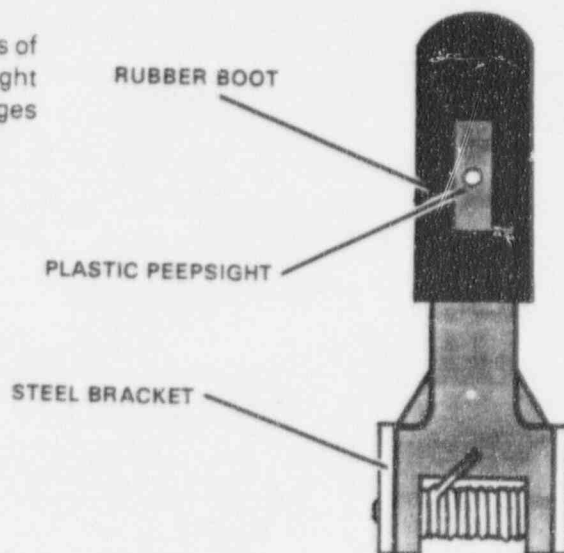
The front sight for the LAW has an embossed vertical range line showing ranges from 50 to 350 meters in 25-meter increments. The front sight on the M72A2 has a promethium range marker at the 100- and 150-meter points to aid the gunner in engaging targets under low light level conditions.

Two curved stadia lines are etched on the front sight, but these lines are no longer used for range estimation. On either side of the vertical line are lead marks which aid the gunner in engaging moving targets.



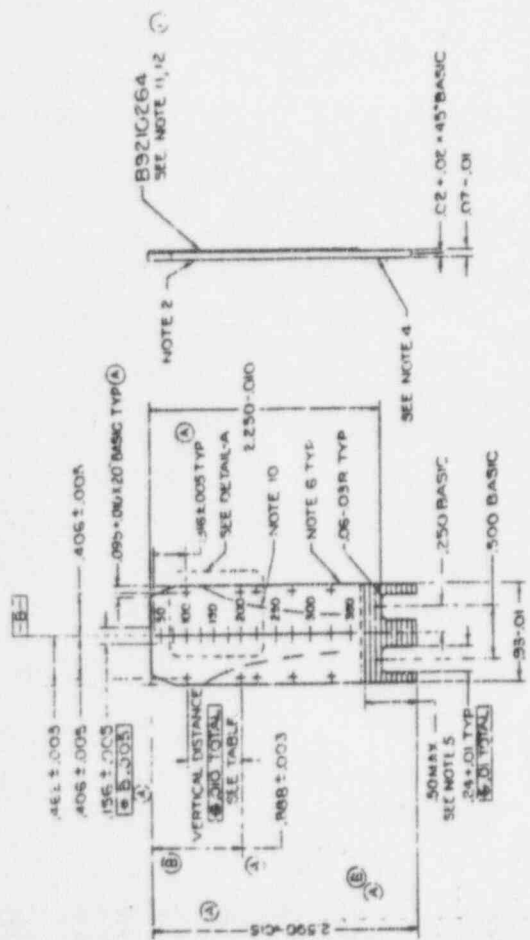
### REAR SIGHT

The rear sight of the LAW consists of a steel bracket and plastic peepsight which automatically adjusts to changes in temperature.

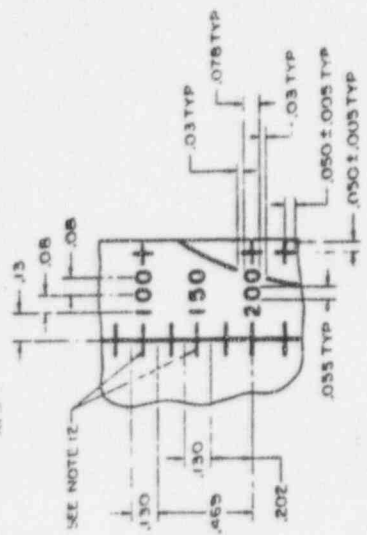




RANGE	VERT DIST FROM 200	HORIZ DIST FROM 200	SEE NOTE
50	756 BASIC		
75	669 BASIC		
100	534 BASIC		
25	356 BASIC	462 ± .005	
150	267 BASIC	401 ± .005	
175	125 BASIC	344 ± .005	
200		301 ± .005	
225	157 BASIC		
250	336 BASIC	241 ± .005	
275	495 BASIC		
300	615 BASIC	201 ± .006	
325	877 BASIC		
350	1065 BASIC	172 ± .005	



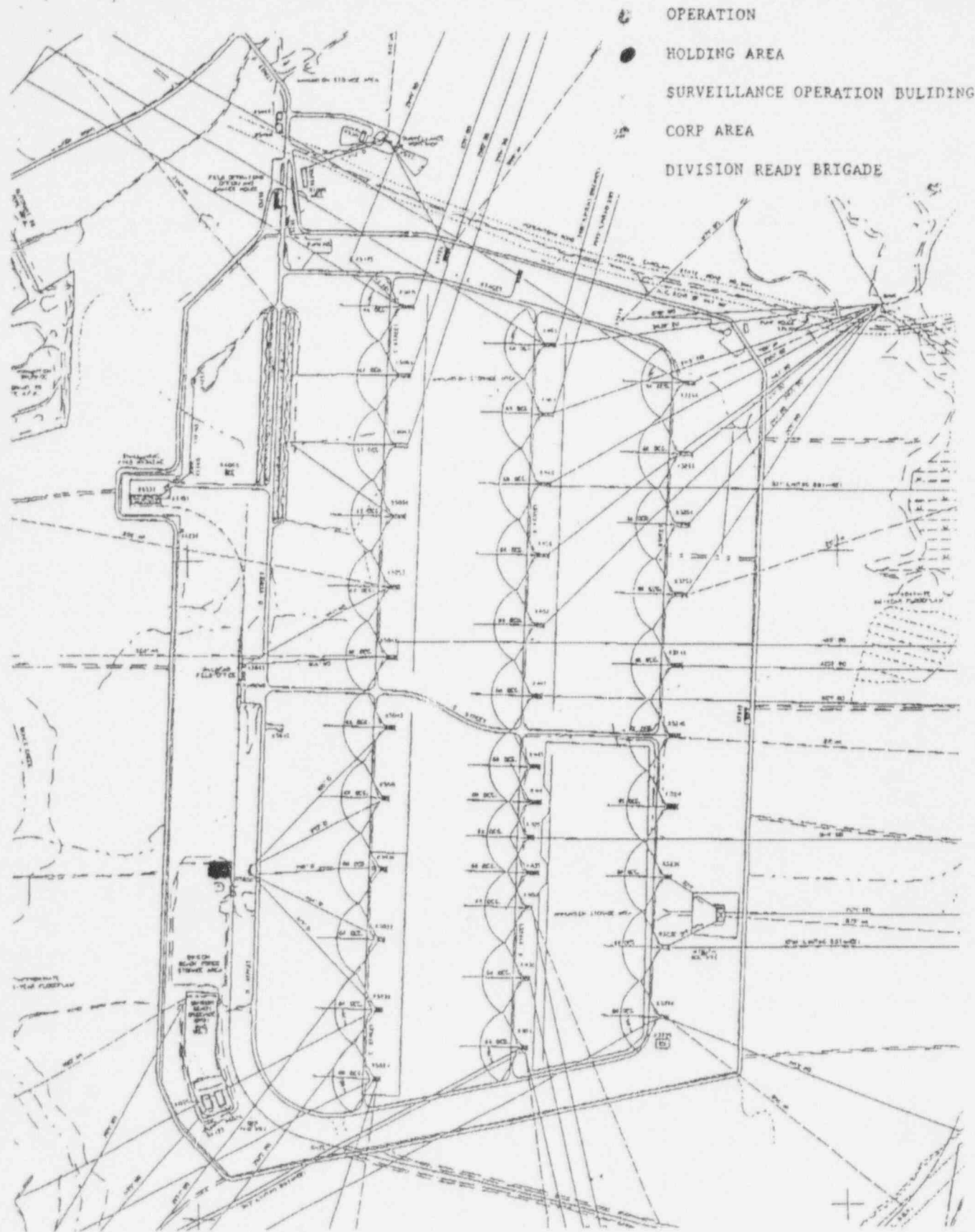
- NOTES:-
- 1- SPEC MIL-A-2550 APPLIES.
  - 2- MATERIAL: MOLDING PLASTIC, METHACRYLATE, TYPE I, CLASS 3, SPEC L-P-380.
  - 3- MANUFACTURER'S MOLD CAVITY NUMBERS. SEE NOTE 4.
  - 4- MOLD NUMBERS TO BE ON INDICATED SURFACE IN AREA SHOWN.
  - 5- NO OR MORE PROTRUSIONS .002 TO .005 IN HEIGHT AS REQUIRED ON SURFACE IN AREA SHOWN.
  - 6- NO GATE TANGS ON SIDES.
  - 7- ALL LINES AND MARKINGS TO BE .010 ± .004 THICK.
  - 8- ALL NUMBERS TO BE .015 WIRE.
  - 9- SQUARE OR ROUND LINE ENDS, OPTIONAL.
  - 10- POINTS FOR STADIA LINES TO BE LOCATED FROM DIMENSIONS GIVEN IN TABLE.
  - 11- PICTURE TO BE NOT STAMPED .003 HIGH WITH RULL LEAF FACET.
  - 12- TO THE 100 AND 150 CENTER MARKS, SEE NOTE 1E.
  - 13- PHOTOLUMINESCENT PRINT 1004-B0-6, THEN APPLY ACETATE PRINT 92-5100. THIS COMBINATION MUST EMIT A MINIMUM BRIGHTNESS OF 100.
  - 14- UNFRAMED DIMENSIONS NEED NOT BE GAGED.



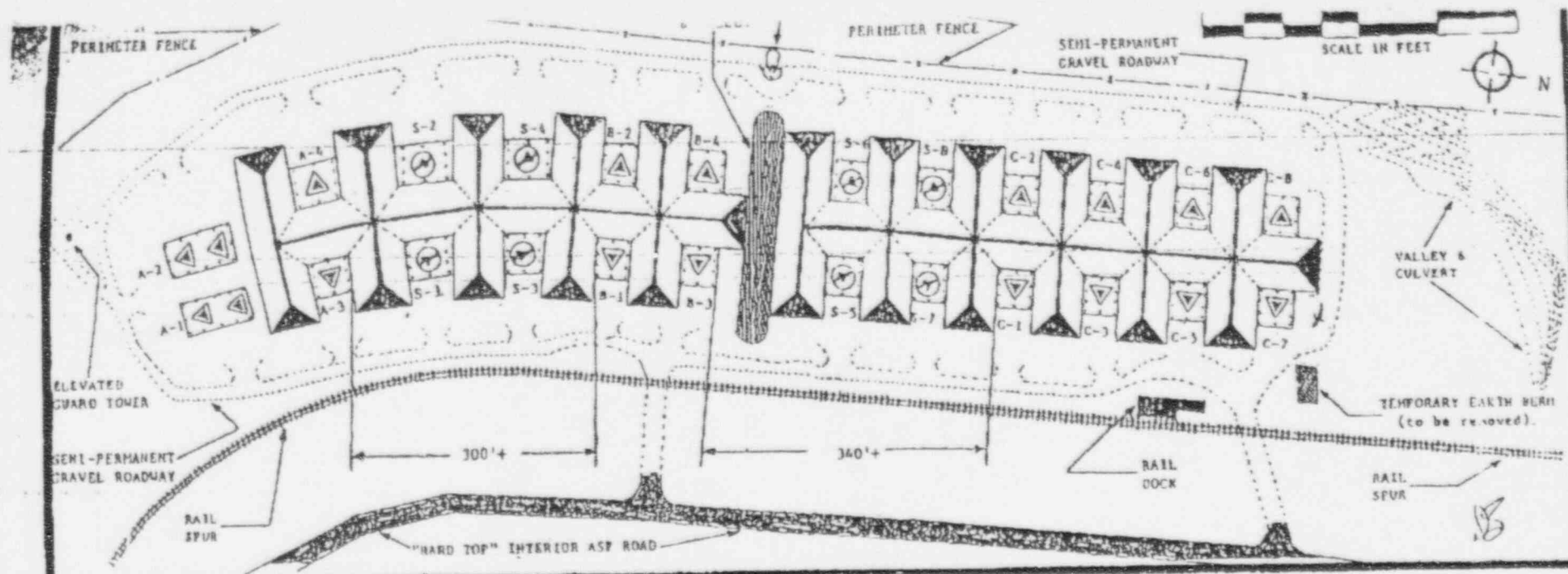
DETAIL - A  
SCALE: 1/4"

[illegible]





Ammunition Supply Point (ASP)  
Ft Bragg



= EARTHEN BERMS  
(BARRICADES).



= "POLE BARN"  
TYPE OVERHEAD  
SHELTERS w/  
LIGHTNING PROTECTION  
SYSTEMS.



= AMMUNITION STORAGE  
OF DRF CONFIGURED  
"PACKAGES".



"STATIC" PADS/CELLS,  
NO STORAGE OF EXPLOSIVE  
OR OTHER HAZ-MATERIAL.

\* MAY POTENTIALLY BE USED FOR  
STORAGE OF INERT MATERIALS TO  
SUPPORT DRF MISSION REQUIRE-  
MENTS, (ie: 463L pallets,  
cargo nets, tie-down straps,  
empty trailers, etc.....).

\* DRF AMMUNITION STORAGE AREA WILL CONSIST OF 3 SEPARATE POTENTIAL EXPLOSIVE SITES (PES), SITES A, B & C. SITE A = 4 PADS (A1 thru A4), SITE B = 4 PADS (B1 thru B4), & SITE C = 8 PADS (C1 thru C8). DISTANCE BETWEEN PES A & PES B = 300+ FEET. DISTANCE BETWEEN PES B & PES C = 340+ FEET. PADS S1 thru S4 and S5 thru S8, IF UTILIZED, WILL CONTAIN INERT MATERIALS TO SUPPORT DRF MISSION REQUIREMENTS AND SHOULD A CREDIBLE EVENT OCCUR, THE RISK OF LOSS/DAMAGE TO THESE MATERIALS IS CONSIDERED ACCEPTABLE.

\*\* SITE A: IBD TO INSTALLATION BOUNDARY = 1,425 ft. & can be licensed for 45 K NEW [NO (18)1.1 or (18)1.2].....  
\*\* SITE B: IBD TO INSTALLATION BOUNDARY = 1,775 ft. & can be licensed for 85 K NEW [NO (18)1.1 or (18)1.2].....  
\*\* SITE C: IBD TO INSTALLATION BOUNDARY = 2,225 ft. & can be licensed for 130K NEW [NO "FRAG" RESTRICTIONS]....

NOTE: \*\* = NEW QUANTITIES SHOWN FOR EACH SITE ARE THE MAXIMUM FOR WHICH THEY MIGHT BE LICENSED, BUT ACTUAL OPERATIONAL NEEDS FOR THE RESPECTIVE SITES ARE ANTICIPATED TO BE APPRECIABLY LESS...