

**NRC LICENSE 12-00722-06 and 16 IMPLEMENTATION INSTRUCTIONS**

---

**INSTRUCTIONS FOR SAFE HANDLING,  
MAINTENANCE, STORAGE AND DISPOSAL  
OF RADIOACTIVE ITEMS**

**UNDER LICENSE 12-00722-06 and 16**

**U. S. ARMY TANK-AUTOMOTIVE  
AND ARMAMENTS COMMAND – ROCK ISLAND**

**March 2004**



**INSTRUCTIONS FOR SAFE HANDLING,  
MAINTENANCE, STORAGE AND DISPOSAL  
OF RADIOACTIVE ITEMS**

**AS LICENSED TO**

**U.S. ARMY TANK-AUTOMOTIVE  
AND ARMAMENTS COMMAND – ROCK ISLAND  
(TACOM-RI)**

---

**March 2004**

---

**DISTRIBUTION STATEMENT.** Distribution authorized to U.S. Government Agencies and their contractors for administrative or operational purposes only. Other requests for this document will be referred to: Commander, U.S. Army Tank-automotive and Armaments Command – Rock Island, ATTN: AMSTA-LC-SF Rock Island IL 61299-7630.

**DESTRUCTION NOTICE.** For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this document. If you find any mistakes or if you know of a way to improve the information, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this bulletin, directly to: Commander, U.S. Army Tank-automotive and Armaments Command – Rock Island, ATTN: AMSTA-LC-SF Rock Island, IL 61299-7630. A reply will be furnished to you.

---

## TABLE OF CONTENTS

	<b>PAGE</b>
Section I.....INTRODUCTION.....	1-1
Section II.....REGULATORY FRAMEWORK ..... .....& COMMAND RESPONSIBILITIES	2-1
Section III.....TRITIUM COMMODITIES.....	3-1
Section IV. ....AMERICIUM-241 COMMODITIES.....	4-1
Section V. .... NICKEL-63 COMMODITIE.....	5-1
Section VI.....TACOM – RI PROMETHIUM COMMODITIES .....	6-1
Section VII DODRATTS .....	7-1
Section VII.....RADIATION SAFETY PROGRAM .....	8-1
Section VIII.....RADIOACTIVE MATERIALS TRANSPORT GUIDELINES.....	9-1
Appendix A.....INCIDENT REPORTING CRITERIA .....	A-1
Appendix B.....GLOSSARY OF TERMS.....	B-1
Appendix C.....RADIOACTIVE MATERIALS SIGNS, LABELS,..... .....AND POSTINGS	C-1
Appendix D.....TRAINING – RELATED INFORMATION .....	D-1
Appendix E.....REFERENCES.....	E-1
Appendix F.....CONTAMINATION ACTION LIMITS .....	F-1

## OUTLINE

The following outline information is not all-inclusive and is provided as a reference guide.

	<b>PARA</b>	<b>PAGE</b>
<b>I. INTRODUCTION</b>		
1. Purpose and Scope .....	1-1	1-1
2. Safety Points of Contact.....	1-2	1-1
3. Objective .....	1-3	1-2
<b>II. REGULATORY FRAMEWORK &amp; COMMAND RESPONSIBILITIES</b>		
1. Regulations .....	2-1	2-1
a. Authority.....	2-1	2-1
b. Definitions .....	2-1	2-1
(1) Code of Federal Regulations .....	2-1	2-1
(2) Approved Licenses.....	2-1	2-2
(3) Department of Defense (DoD) Regulations .....	2-1	2-2
(4) Army Regulations .....	2-1	2-2
2. Command Responsibilities .....	2-2	2-3
a. Employer/Employee Obligation to Maintain Occupational Exposures As Low As Reasonably Achievable (ALARA) .....	2-2	2-3
(1) Employers.....	2-2	2-3
(2) Soldiers, DA Employees, DA Contractors .....	2-2	2-3
b. Other Responsible Commands .....	2-2	2-3
(1) Training and Doctrine Command (TRADOC) .....	2-2	2-4
(2) Industrial Operations Command (IOC) .....	2-2	2-4
(3) Installation Commanders .....	2-2	2-4
(4) Installation RSO (IRSO) .....	2-2	2-4
(5) Tenant RSO (TRSO) .....	2-2	2-4
(6) Unit RSO (URSO) .....	2-2	2-5
(7) End Users .....	2-2	2-5
3. Permissible Deviations .....	2-3	2-5
a. Federal Regulations .....	2-3	2-5
b. Army Regulations .....	2-3	2-5
<b>III. TRITIUM COMMODITIES</b>		
1. Description and Location of Tritium Devices .....	3-1	3-1
a. M1A1 Collimator .....	3-1	3-3
b. Infinity Collimator (MRS) .....	3-1	3-4
c. M58 and M59 Aiming Post Lights .....	3-1	3-6
d. M64A1 Sight Unit w/M9 Elbow Telescope .....	3-1	3-6

## OUTLINE (Continued)

ADVANCED COPY TB 43-0197 OUTLINE	PARA	PAGE
e. M67 Sight Unit .....	3-1	3-7
f. M114A1 Elbow Telescope .....	3-1	3-7
g. M137 Panoramic Telescope.....	3-1	3-8
h. M137A1 Panoramic Telescope .....	3-1	3-8
i. M138 Elbow Telescope .....	3-1	3-9
j. M113A1 Panoramic Telescope .....	3-1	3-9
k. M224 Mortar Range Indicator.....	3-1	3-10
l. M139/M140 Alignment Devices .....	3-1	3-10
m. M187 Telescope Mount and Quadrant.....	3-1	3-11
n. M14A1 Fire Control Quadrant .....	3-1	3-11
o. M18 Fire Control Quadrant .....	3-1	3-12
p. M17 Fire Control Quadrant .....	3-1	3-12
q. M90A2 Straight Telescope .....	3-1	3-13
r. M134A1 Telescope Mount.....	3-1	3-13
s. M171 Telescope Mount.....	3-1	3-13
t. M1A2 Gunner's Quadrant .....	3-1	3-14
u. M11 Pistol.....	3-1	3-14
v. M16A1 Rifle Front Sight Post .....	3-1	3-14
w. M3 Recoiless Rifle (RAAWS) Sights .....	3-1	3-15
2. Emergency Procedures .....	3-2	3-16
a. Damaged Tritium Device.....	3-2	3-16
b. Damaged MRS/M1 Series Tank Gun Tube .....	3-2	3-16
c. Tritium-exposed Personnel Special Bioassay Requirements .....	3-2	3-17
d. Tritium Decontamination .....	3-2	3-18
3. Incident Reporting Requirements .....	3-3	3-18
4. Safe Handling Procedures .....	3-4	3-18
IV. AMERICIUM-241 COMMODITIES		
1. Device Description.....	4-1	4-1
2. Emergency Procedures.....	4-2	4-2
3. Incident Reporting Requirements.....	4-3	4-3
4. Safe Handling Procedures.....	4-4	4-4
V. NICKEL-63 COMMODITIES		
1. Device Descriptions and Locations.....	5-1	5-1
2. Emergency Procedures.....	5-2	5-3
3. Incident Reporting Requirements.....	5-3	5-3
4. Safe Handling Procedures.....	5-5	5-3

## OUTLINE (continued)

### ADVANCED COPY TB 43-0197 OUTLINE

PARA PAGE

#### VI. PROMETHIUM 147 COMMODITIES

1. Device Description and Location.....	6-1	6-1
2. Emergency Procedures.....	6-2	6-1
3. Incident Reporting Requirement.....	6-3	6-2
4. Safe Handling Procedures.....	6-4	6-2

#### VII. DOD RADIATION TESTING AND TRACKING SYSTEM

1. Introduction.....	7-1	7-1
2. Responsibilities.....	7-2	7-1
3. Transaction Reporting.....	7-3	7-2

#### VIII. RADIATION SAFETY PROGRAM

1. Radiation Safety Committees (RSC)..... and ALARA Concepts	8-1	8-1
2. Training Requirements .....	8-2	8-3
a. Users .....	8-2	8-3
b. Maintainers .....	8-2	8-3
c. RSO Level Personnel.....	8-2	8-3
3. Control of Radioactive Commodities.....	8-3	8-4
a. Depot Storage.....	8-3	8-4
(1) Surveys .....	8-3	8-4
(2) Air Monitoring .....	8-3	8-4
(3) Storage.....	8-3	8-4
b. Depot Maintenance .....	8-3	8-5
(1) Air Monitoring.....	8-3	8-5
(2) Fume Hoods.....	8-3	8-5
(3) Storage.....	8-3	8-5
(4) Ventilation.....	8-3	8-5
(5) Surveys .....	8-3	8-5
c. Posting Requirements .....	8-3	8-5
d. Monitoring Requirements .....	8-3	8-6
(1) Radiation vs. Contamination.....	8-3	8-6
(2) Exposure vs. Dose .....	8-3	8-7
(3) Wipe Surveys vs. Leak Testing .....	8-3	8-7
(4) Radiological Controls vs. Surveillance.....	8-3	8-8
(5) Instrument Selection .....	8-3	8-9
(6) RADIAC Instrumentation.....	8-3	8-9
(a) Portable Beta/Gamma Survey Instruments .....	8-3	8-9
(b) Calibration .....	8-3	8-10

## OUTLINE (Continued)

---

**ADVANCED COPY TB 43-0197** **PARA PAGE**  
**OUTLINE**

(7) Air Quality Monitoring .....	8-3	8-10
(8) Surface Contamination Surveys .....	8-3	8-10
e. Inventory Requirement .....	8-3	8-11
4. Inspections .....	8-4	8-12
5. Radioactive Waste .....	8-5	8-12

### IX. RADIOACTIVE MATERIAL TRANSPORT GUIDELINES

1. Introduction .....	9-1	9-1
2. Regulatory Authority .....	9-2	9-1
3. Definitions (49 CFR 173.403) .....	9-3	9-2
4. Overview of Excepted Packages Regulations .....	9-4	9-2
5. Survey Procedures Prior to Shipment .....	9-5	9-4
6. Receiving and Opening Packages .....	9-6	9-5
7. Incident Notification .....	9-7	9-6
8. Status of Forces Agreements (SOFA) .....	9-8	9-7
9. Security Issues .....	9-9	9-7

### APPENDICES

A. INCIDENT REPORTING CRITERIA .....	A-1
B. GLOSSARY OF TERMS .....	B-1
C. RADIOACTIVE MATERIAL SIGNS, LABELS, AND POSTINGS .....	C-1
D. TRAINING-RELATED INFORMATION .....	D-1
E. REFERENCES .....	E-1
F. CONTAMINATION ACTION LIMITS .....	F-1

## SECTION I. INTRODUCTION

### SECTION INDEX

	Para	Page
Purpose and Scope .....	1-1	1-1
Safety Points of Contact .....	1-2	1-1
Objective .....	1-3	1-2

**1-1. PURPOSE AND SCOPE.** The purpose of this document is to assist the reader to identify radioactive commodities, in the Army supply system, that are managed by the U.S. Army Tank-Automotive and Armaments Command – Rock Island (TACOM-RI). To varying degrees it has applicability for command elements within the active service, the Army Reserves, the National Guard and the Marine Corps. This document is intended to implement the Army's radiation safety program and provide a general description of its regulatory basis. It serves as a useful guide to, and safety instruction for, radioactive items covered by Nuclear Regulatory Commission (NRC), Radioactive Materials License number 12-00722-06 and 16, held by TACOM-RI.

The safety information contained in this document is intended to help protect Army personnel from unnecessary exposure to radioactive materials, promote license compliance, and protect the integrity of the Army's radioactive commodities inventory. It may also be used as a guide in determining and implementing appropriate procedures for the procurement, use, storage, maintenance, transfer and disposal of radioactive commodities. Listed in this document are current, as well as some obsolete, radioactive items with information pertaining to their National Stock Number, nomenclature, the classification type of the end item and storage criteria. Included is information regarding the radioactive isotope(s) of interest, their respective radioactive properties, and related safety considerations.

**1-2. SAFETY POINTS OF CONTACT.** The TACOM-RI License Staff, headquartered at Rock Island Arsenal, Illinois, serves as the point of contact for radiological assistance, incident notification and limited emergency response related to licenses 12-00722-06 and 16 safety issues. The following contact information is provided to encourage personnel to contact this office for information, general support and assistance in dealing with TACOM-RI's radioactive commodities.

## INTRODUCTION (Continued)

---

Mailing address:

Department of the Army

AMSTA-CS-CZR

U.S. Army Tank-automotive and Armaments Command

1 Rock Island Arsenal

Rock Island, IL 61299-7630

Office Phone: DSN 793-6499 or (309) 782-6499

FAX: DSN 793-6758 or (309) 782-6758

Email: amsta-ac-sf@ria.army.mil

After hours Duty Number (Emergencies):

DSN 793-6001 or (309) 782-6001

**1-3. Objective.** The objective of this document is license implementation. The reader has two responsibilities:

- a. Learn and implement the license requirements; and
- b. Learn to recognize the radioactive symbol below and act accordingly:



**Radiation Trefoil**

---

## SECTION II. REGULATORY FRAMEWORK & COMMAND RESPONSIBILITIES

### SECTION INDEX

	Para	Page
Regulations .....	2-1	2-1
Command Responsibilities.....	2-2	2-3
Permitted Deviations .....	2-3	2-5

#### 2-1. REGULATIONS.

##### a. Authority.

In 1946 the Atomic Energy Commission (AEC) was established. After 1950 the AEC began promulgating standards for the protection of individuals and the public from ionizing radiation. Definitive progress was achieved with the enactment of the Atomic Energy Act of 1954. However, the authority of the AEC was limited by definition to “by-product material, source material, and special nuclear material”. The Energy Reorganization Act of 1974 established the current Nuclear Regulatory Commission (NRC). The AEC was abolished and its regulatory and licensing functions were transferred to the NRC, which is legally empowered to protect public health and safety, the environment and the safety of nuclear materials. The NRC accomplishes this through the setting of standards, rulemaking, issuance of authorizations, permits and licenses and the enforcement of these through inspections and investigations. DOD and Army policies and procedures are based on federal regulations, established by the NRC.

##### b. Definitions.

(1) Code of Federal Regulations. The Code of Federal Regulations (CFR) is a codification of general and permanent rules established by the Executive departments and agencies of the Federal Government. The CFR is divided into 50 titles made up of over 120 volumes. Title 10, ENERGY, contains statutes pertaining to radiation. Volumes one and two of Title 10 contain regulations pertaining specifically to the Nuclear Regulatory Commission. “Standards For Protection Against Radiation” are set forth in Title 10, Part 20 (10 CFR 20). Other Parts of Title 10, as well as Parts of Title 49, cover issues of radioactive material transportation, control and surveillance. The “standards” set forth in the CFR, are statutory regulations, and therefore carry the force of federal law. Compliance with a given regulation is mandatory. The TACOM-RI license and Army Radiation Safety Programs are derived from these CFR requirements.

## REGULATORY FRAMEWORK & COMMAND RESPONSIBILITIES (Continued)

---

- (2) Regulatory Guide. A regulatory guide is published under approval authority of the NRC. Regulatory guides describe methods and procedures for implementation of programs approved by the Commission and document additional references and written source materials for radiation protection programs. The guides do not impose any legal requirement to implement programs described therein. Therefore, compliance with a regulatory Guide is not necessarily mandatory. Alternative methods and procedures may be adopted pending acceptance and approval by the regulating agency.
- (3) Approved Licenses. The NRC is responsible for licensing the use of radioactive materials. The licensee is responsible to provide the NRC with a program that will properly control the use, storage, maintenance and disposal of the radioactive materials in their possession. A NRC license is a legal document that authorizes the procurement and utilization of particular types, quantities, and forms of radioactive material within well-defined guidelines, for a specified period of time. License requirements therefore retain the force of law and carry fines and penalties for identified violations. The NRC retains the right to periodically review license commitments and inspect licensee facilities as well as approval authority for formal requests to amend or renew a license.

The TACOM-RI License No. 12-00722-06 governs Tritium gas located in rifle sights and various fire control devices, and Promethium-147 located in rifle sights. This license is effective until August 31, 2008. TACOM-RI License No. 12-00722-16 governs Ni 63 and Am 241 used in the M43A1, ICAM/CAM and ACADA Chemical Agent Devices. This license is effective until January 31, 2014.

- (4) Department of Defense (DoD) Regulations. DoD regulations take the form of directives, manuals developed pursuant to directives, and instructions. These regulations represent general programmatic outlines that identify program elements without attempting to be prescriptive and are applicable to all armed forces and uniformed services. The Department of Defense is the lead federal agency designated to develop guidance consistent with statutory requirements. DoD guidance can not be less stringent than federal regulations nor revoke an NRC license. However, DoD can suspend Army regulation or order the cessation of work-related activities under an existing NRC license.
- (5) Army Regulations. Army regulations are derived from programmatic requirements outlined in Department of Defense directives and instructions. Army regulations may legally be substituted for DoD regulations if authorized by the Secretary of Defense or his representative(s). Army regulations apply to all active and reserve Department of Army (DA) personnel and the National Guard. Army

## REGULATORY FRAMEWORK & COMMAND RESPONSIBILITIES (Continued)

---

regulations cannot be less stringent than federal regulations nor revoke an NRC license.

### 2-2. COMMAND RESPONSIBILITIES.

- a. **Employer-Employee Obligation to Maintain Occupational Exposures As Low As Reasonably Achievable (ALARA).** The NRC publishes allowable annual exposure limits for occupational workers; however, from a regulatory perspective it has taken the position that all unnecessary exposure should be avoided. Current exposure limits must be viewed as upper limits only, and unnecessary exposure below these limits is not acceptable when it can be reasonably avoided. The NRC's philosophy is summarized by the principle of ALARA, and is spelled out in 10 CFR 20.1101(b):

**“The licensee shall use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).”**

- (1) EMPLOYERS, the Army in this case, is responsible to establish a safety program. The safety program must emphasize protection of personnel from any and all sources of radiation exposure. The Army is responsible for providing worker training commensurate with the safety hazards associated with a particular job classification, monitoring its workers exposure when appropriate, implementing controls to minimize personnel exposures and posting information which enable employees to directly contact the NRC with questions or concerns about radiation safety.
- (2) SOLDIERS, DA EMPLOYEES, and DA CONTRACTOR PERSONNEL have an obligation to follow procedures, minimize their exposure to radiation, and act in a manner to protect themselves and others. Workers must understand and obey safety regulations and report observed violations to the appropriate Radiation Safety Officer (RSO) or the licensee (TACOM-RI). Workers retain the right to contact the NRC directly, and are protected by federal law against adverse actions. However, the chain of command should be utilized to its full extent whenever possible. The Army treats potential regulatory or license violations as a serious matter.

b. **Other Responsible Commands**

There are a number of Army personnel, groups and command elements involved in license compliance and the implementation and maintenance of a Radiation Safety Program. While Army regulations may not specifically call out responsibilities as outlined in the following paragraphs, it is reasonable to suggest that personnel involvement with ongoing implementation of the health

## REGULATORY FRAMEWORK & COMMAND RESPONSIBILITIES (Continued)

---

and safety program should be commensurate with level of command authority and duty responsibility. Following is a brief overview of the major commands and elements having significant responsibility for assuring continuing compliance with requirements of radiation safety programs and the TACOM-RI radioactive materials license.

- (1) **Army Training and Doctrine Command (TRADOC).** TRADOC provides initial radiation safety instruction as part of Advanced Individual Training (AIT) courses. Personnel with Military Occupational Specialties (MOS) that involve the use and or maintenance of commodities containing radioactive sources must receive radiation safety training.
- (2) **Operations Support Command (OSC)** The OSC provides low-level radioactive waste (LLRW) disposal services for the Army. The Low Level Radioactive Waste Disposal Team is located at Headquarters, OSC, Rock Island Arsenal, Illinois.
- (3) **Installation Commanders.** Commanders of Camps, Posts, and Stations are responsible for maintaining adequate oversight and control of radioactive commodities located within their facilities (AR 11-9). Commanders are required to designate, in writing, a qualified individual to serve as Radiation Safety Officer (RSO), with responsibilities as delineated in AR 11-9, Chapter 1-4. At their discretion, commanders may establish an Installation Radiation Safety Committee (RSC). (AR 11-9)
- (4) **Installation RSO.** The installation commander must appoint the Camp, Post, or Station RSO (IRSO) in writing (AR 11-9). His/her primary responsibility is to assure compliance with specific license requirements and the implementation and conduct of a radiation safety program. The RSO must ensure personnel receive appropriate radiation safety training, assure appropriate inventory control of radioactive commodities, coordinate occupational health surveillance with medical personnel, participate in the development of emergency response procedures and serve as the recorder of the RSC. Each Camp, Post and Station should also appoint, in writing, an alternate IRSO. The alternate IRSO must be qualified to stand in for the IRSO in His/Her absence.
- (5) **Tenant Radiation Safety Officer (TRSO).** Under certain circumstances, such as a NRC license requirement, AR 11-9 requires a tenant commander to designate, in writing, a radiation safety officer for the tenant activity. The Tenant RSO (TRSO) is responsible for radioactive commodities used, maintained, or stored by the tenant activity. The TRSO must work closely with the IRSO to ensure commodities are handled within the parent commands regulations and should be part of the Installation RSC. The IRSO is ultimately responsible for all radioactive materials on his or her post.

## REGULATORY FRAMEWORK & COMMAND RESPONSIBILITIES (Continued)

---

- (6) **Unit Radiation Safety Officer (URSO).** It is suggested that a Unit RSO be assigned for any unit holding commodities containing licensed radioactive materials. The Unit RSOs (or Local RSOs) should be assigned by Unit commanders, in writing, to assist TRSO's and IRSO's in the functional elements of the radiological safety program. The URISO would be responsible to assure that the functional tasks associated with license and regulatory compliance are carried out and documented at the user level. The URISO should coordinate documentation and reporting of radiation incidents, perform reviews of areas for potential non-compliance, and be part of the installations RSC.

RSOs, regardless of their organizational location, should have continuous direct access to their respective commander in matters involving radiation safety.

- (7) **End Users.** End users are personnel who use, maintain, store, ship or receive Army commodities containing radioactive sources, in the course of their duties. This means compliance with procedures and instructions contained in the technical manuals approved for use at the appropriate level of work. End users are responsible for strict adherence to Army safety procedures and regulations and must maintain their exposure to radioactivity As Low As Reasonably Achievable (ALARA). Field personnel must be able to recognize equipment containing radioactive sources and know how to safely handle and control such equipment during emergency and day to day situations.

### 2-3. PERMISSIBLE DEVIATIONS

a. **Federal Regulations.**

EXCEPT in the case of *armed conflict*, NO deviations from Federal regulations (NRC and DOT), DoD regulations and standards or TACOM-RI license commitments are allowed.

b. **Army Regulations.**

Headquarters, Department of the Army, (DACS-SF), approves deviations from Army Safety Standards and Policies.

- c. Authority to accept residual risk levels for federal or D.o.D. regulations must be requested by a MACOM commanding general, the superintendent of the U.S. Military Academy or the Chief, National Guard Bureau. Forward requests through command channels to H.Q.D.A. (DACS-SF), Wash, DC 20310-0200 for waivers and exceptions.

**REGULATORY FRAMEWORK & COMMAND RESPONSIBILITIES (Continued)**

---

This page is intentionally left blank.

## SECTION III. TRITIUM COMMODITIES

<b>SECTION INDEX</b>		
	Para	Page
Description and Location of Tritium Devices .....	3-1	3-1
Emergency Procedures .....	3-2	3-16
Incident Reporting Requirements.....	3-3	3-18
Safe Handling Procedures .....	3-5	3-18

### 3-1. DESCRIPTION AND LOCATION OF TRITIUM DEVICES.

<b>M1 Series Tank</b>	<b>Activity (in Curies)</b>	<b>PAGE</b>
MRS Muzzle Reference Sensor.....	10.0	3-4
M1A2 Gunner's Quadrant.....	0.075	3-14
 <b>M119A1 Howitzer</b>		
M137A1 Panoramic Telescope .....	5.1	3-8
M187 Telescope Mount & Quadrant .....	2.65	3-11
M90A2 Straight Telescope .....	1.6	3-13
M140 Alignment Device .....	3.0	3-10
M1A1 Collimator.....	10.0	3-3
M1A2 Gunner's Quadrant.....	0.075	3-14
 <b>M102 Howitzer</b>		
M113A1 Panoramic Telescope .....	3.8	3-8
M134A1 Telescope Mount.....	0.15	3-13
M114A1 Elbow Telescope .....	5.6	3-7
M14A1 Fire Control Quadrant.....	2.15	3-11
M140 Alignment Device .....	3.0	3-9
M1A1 Collimator.....	10.0	3-3
M1A2 Gunner's Quadrant.....	0.075	3-14
 <b>M198 Howitzer</b>		
M137 Panoramic Telescope .....	5.1	3-8
M171 Telescope Mount.....	0.15	3-13

**TRITIUM COMMODITIES (Continued)**

	<b>Activity (in Curies)</b>	<b>Page</b>
M17	Fire Control Quadrant.....	1.875 3-12
M18	Fire Control Quadrant.....	1.95 3-12
M138	Elbow Telescope .....	4.4 3-9
M139	Alignment Device .....	3.0 3-10
M1A1	Collimator.....	10.0 3-3
M1A2	Gunner's Quadrant.....	0.075 3-14
 <b>M110 &amp; M109 Series self-propelled Howitzer</b>		
M140	Alignment Device .....	3.0 3-10
M1A1	Collimator.....	10.0 3-3
M1A2	Gunner's Quadrant.....	0.075 3-14
 <b>M224 Mortar</b>		
M58	Aiming Post Light .....	5.0 3-6
M59	Aiming Post Light .....	9.0 3-6
M64A1	Sight Unit .....	6.69 3-6
M224	Range Indicator .....	3.2 3-10
M1A2	Gunner's Quadrant.....	0.075 3-14
 <b>M252 Mortar</b>		
M58	Aiming Post Light .....	5.0 3-6
M59	Aiming Post Light .....	9.0 3-6
M64A1	Sight Unit .....	6.69 3-6
M1A2	Gunner's Quadrant.....	0.075 3-14
 <b>M120 Mortar</b>		
M58	Aiming Post Light .....	5.0 3-6
M59	Aiming Post Light .....	9.0 3-6
M67A1	Sight Unit .....	5.79 3-7
M1A2	Gunner's Quadrant.....	0.075 3-14
 <b>M16A1 Rifle</b>		
	Front Sight Post .....	0.009 3-14
 <b>M11 Pistol, 9MM</b>		
	Front Sight Post .....	0.018 3-14
	Rear Sight Assembly .....	0.036 3-14

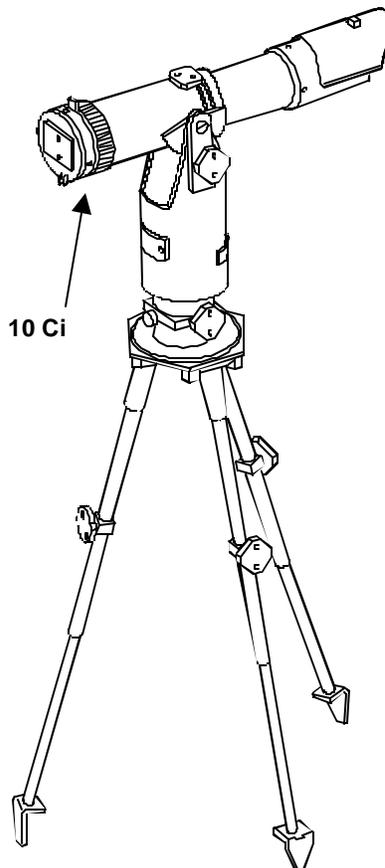
## TRITIUM COMMODITIES (Continued)

### M3 Recoilless Rifle

Flair Sight..... 0.21 3-15

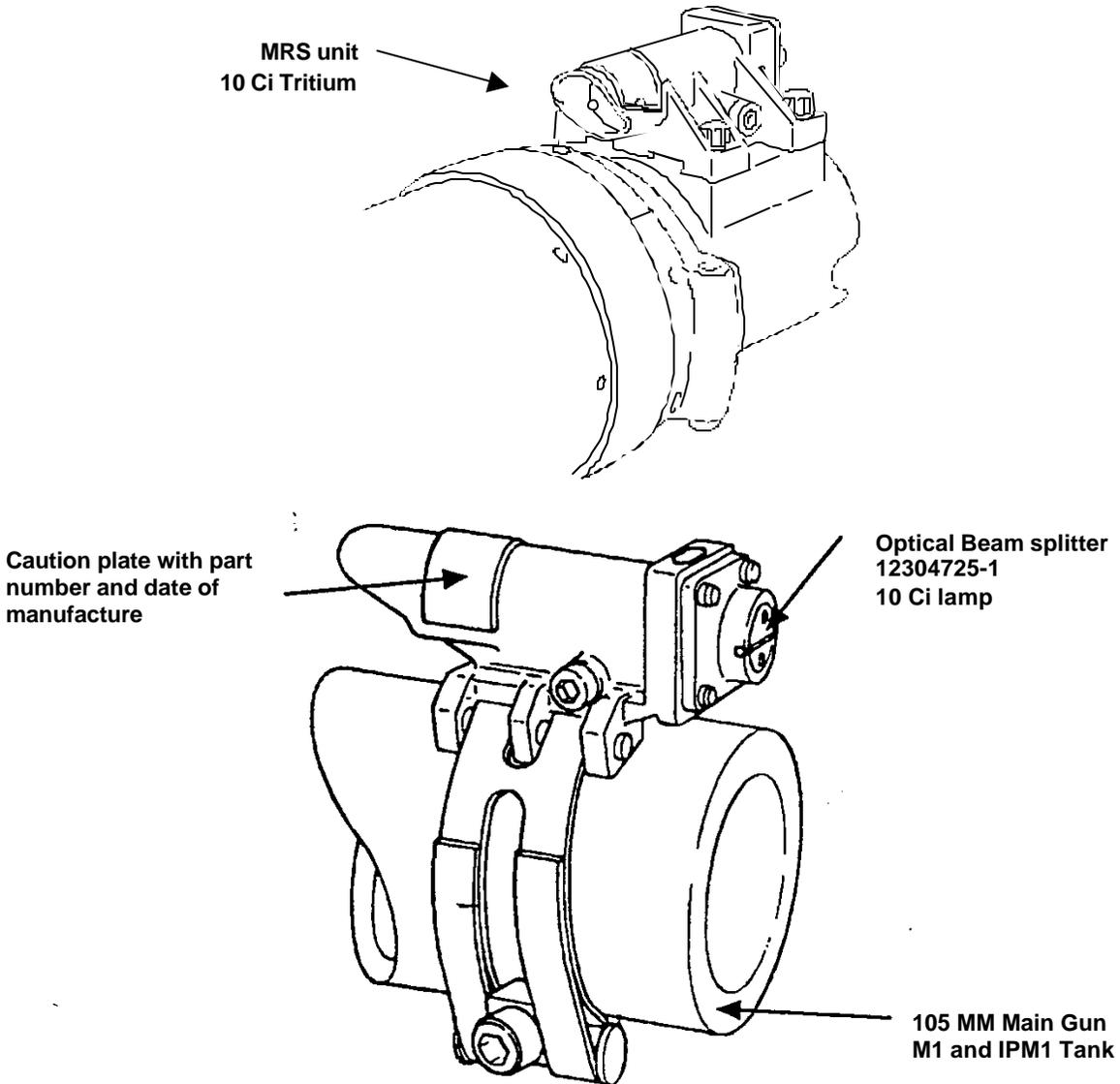
### ILLUSTRATED DESCRIPTIONS OF TRITIUM DEVICES

- a. **M1A1 Collimator (NSN 1240-00-332-1780)** Reference point used with field artillery and contains a 10 Curie Tritium Source, PN 10556135. **CAUTION:** Perform Illumination checks before maintenance or use. Do not attempt to perform any maintenance if it is suspected that the Tritium light source is leaking (no illumination). If the light source is not illuminated, immediately double bag the entire collimator and follow emergency procedures. This device has a field maintenance procedure that requires purging and charging with dry nitrogen. The procedure (TM 750-116) is performed using a nitrogen gas regulator set at **3 psi or less**. **Do not purge the collimator if you do not have the proper regulator**. The tritium source is made of fragile glass and will break if subjected to pressures greater than 3 psi. Failure of maintenance personnel to read and follow TM instructions may result in radiological contamination and NRC sanctions.



## TRITIUM COMMODITIES (Continued)

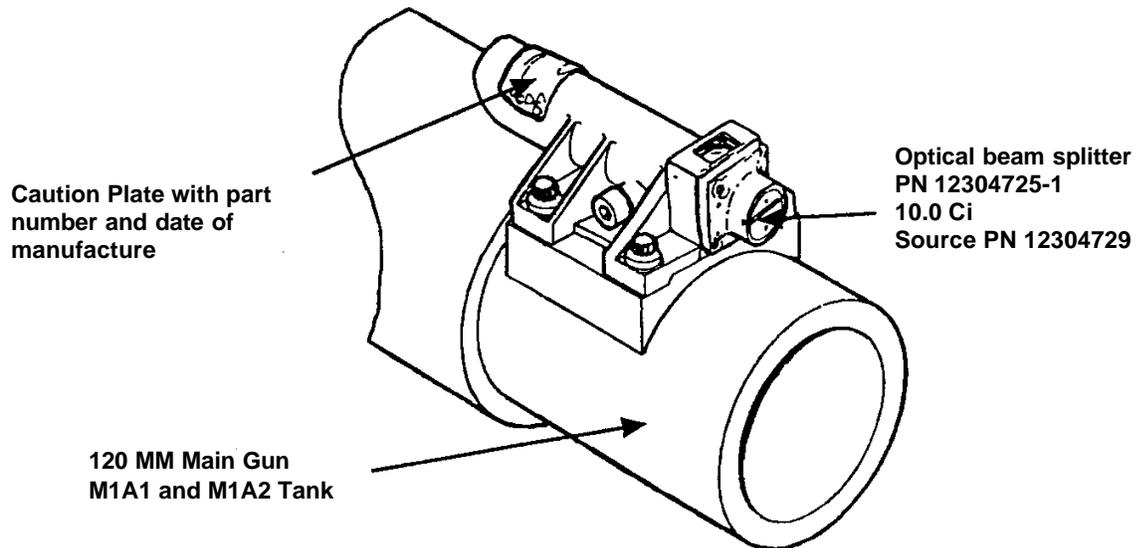
- b. **Infinity Collimator (MRS).** The **Muzzle Reference Sensor (MRS)** located on the end of the main gun tube of all M1 Series tanks have a beam splitter assembly which contains a 10 curie tritium light source. This light source is completely contained within the beam splitter and poses no external radiation threat unless the Pyrex vial is broken. If there is no apparent illumination when viewed in subdued light the source may be leaking. The entire MRS should be double bagged. **Do not remove the beam splitter assembly from the MRS. Removal of the beam splitter may only be performed at depot maintenance level.**



M1 / IPM1 Tank  
Muzzle Reference Sensor  
NSN: 1240-01-324-2217

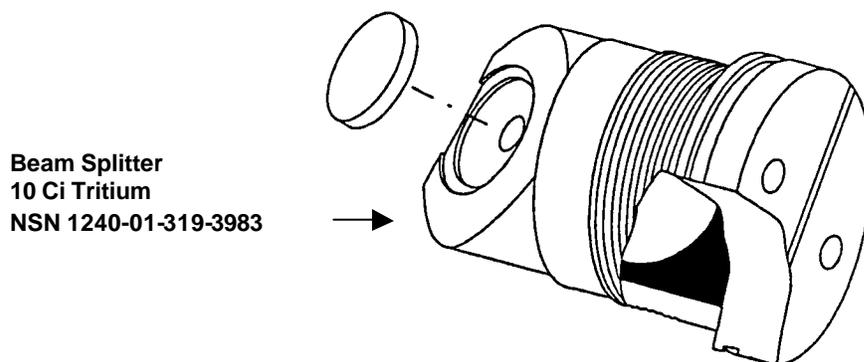
## TRITIUM COMMODITIES (Continued)

---



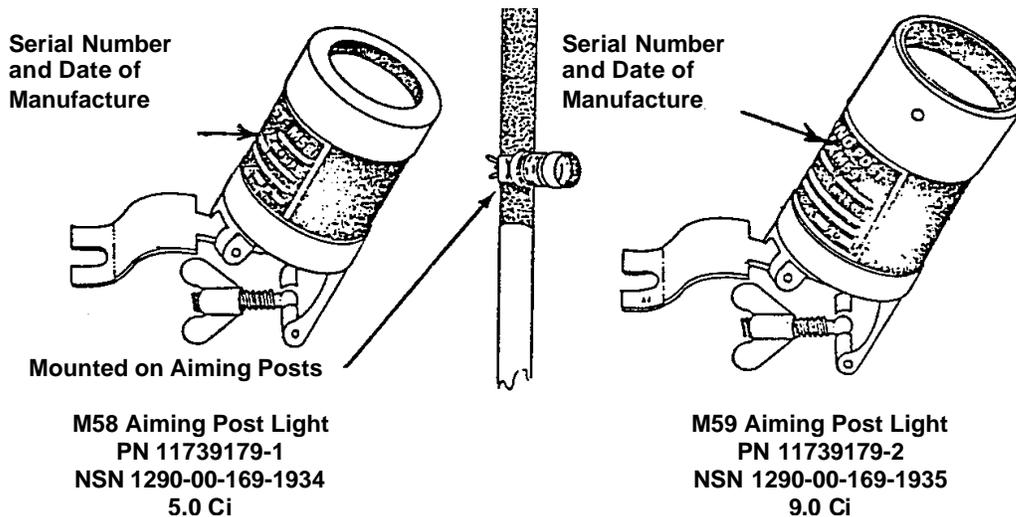
M1A1 Tank NSN: 2350-01-087-1095  
Muzzle Reference Sensor  
NSN: 1240-01-313-8932

M1A2 Tank NSN: 2350-01-328-5964  
Muzzle Reference Sensor  
NSN: 1240-01-356-5887



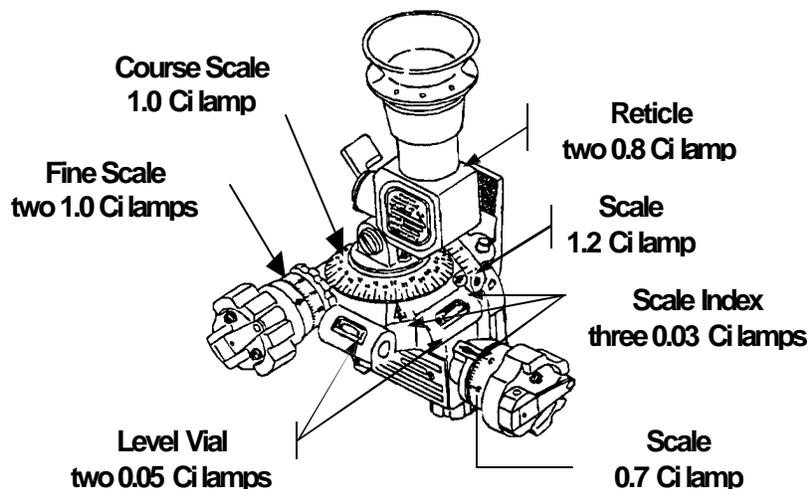
## TRITIUM COMMODITIES (Continued)

- c. **M58 and M59 Aiming post lights.** Containing a 5.0 and 9.0 curie tritium light source, respectively. PN 11739179-1 and PN 11739179-2.



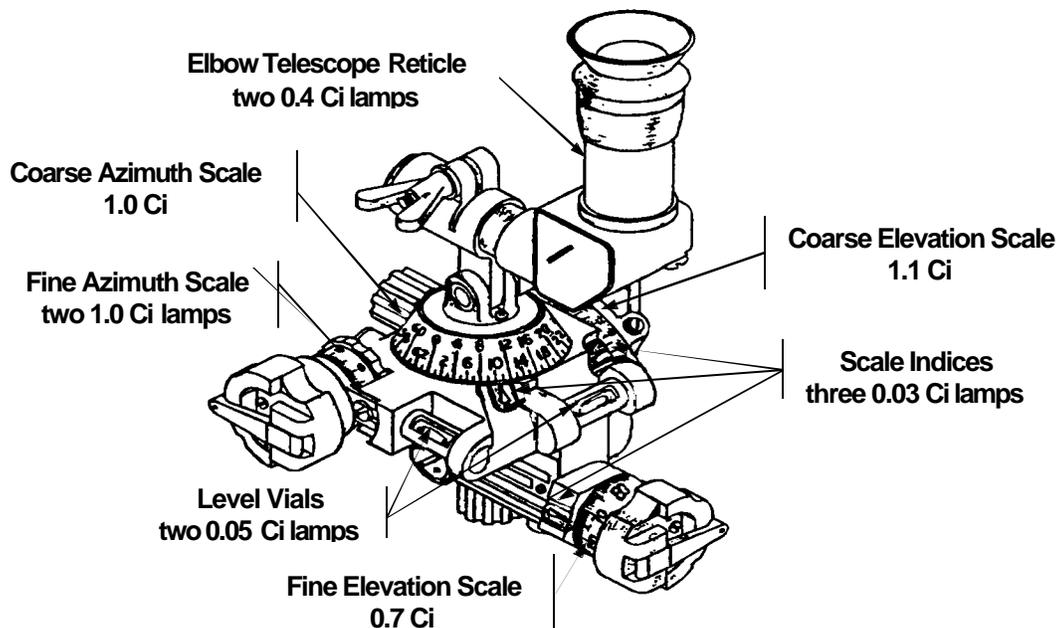
- d. **M64A1 Sight Unit (NSN 1240-01-379-7953) w/M9 Elbow Telescope.**

Total activity of 6.69 Ci: two source in the level vial, PN 11729510-0, containing 0.05 Ci; one source in the coarse azimuth scale, PN 11733736, containing 1.0 Ci; one source in the coarse elevation scale, PN 11733737, containing 1.2 Ci; three sources in the scale indices, PN 11733738, containing 0.03 Ci each; one source in the fine elevation scale, PN 11733744-1, containing 0.7 Ci; two sources in the fine azimuth scale, PN 11733744-2, each containing 1.0 Ci; and two sources in the reticle, PN 11739555, each containing 0.8 Ci.

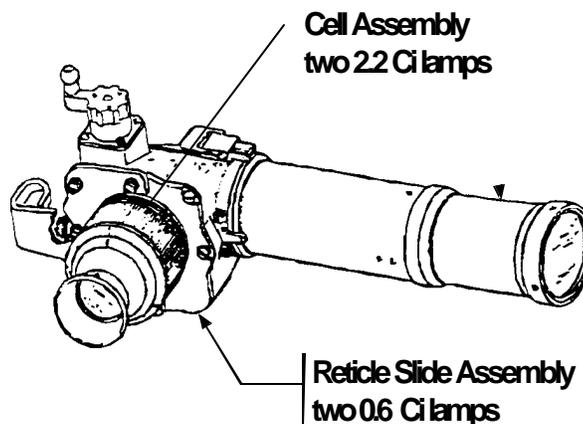


## TRITIUM COMMODITIES (Continued)

- e. **M67 Sight Unit (NSN 1240-01-366-73223)**. Total activity of 5.79 Ci: two sources in the reticle, PN 9356141, 0.4 Ci each; one source in the course elevation scale, PN 9356170, containing 1.1 Ci; two in the level vials, PN 11729510-1, 0.05 Ci each; one light source, PN 11733736, containing 1.0 Ci; three sources in the scale indices, PN 11733738, containing 0.03 Ci each; on source in the fine elevation scale, PN 11733744-1, containing 0.7 Ci; and two light sources in the fine azimuth scale, PN 11733744-2, each containing 1.0 Ci.

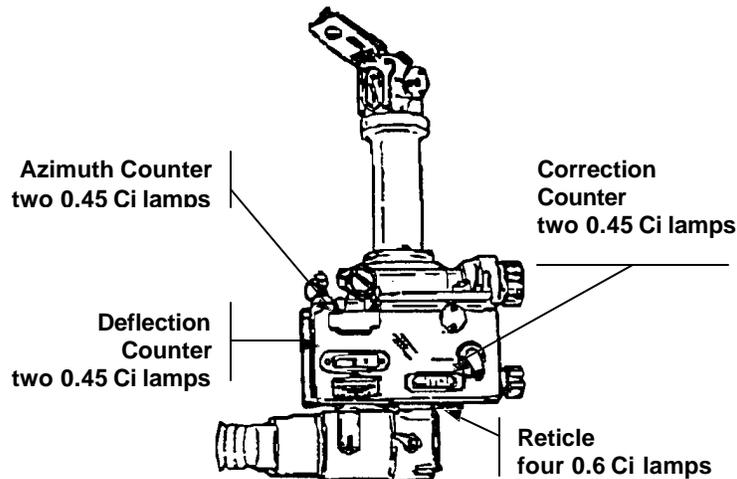


- f. **M114A1 Elbow Telescope (NSN 1240-00-150-8889)**. Total activity of 5.6 Ci: two light sources in the reticle slide assembly, PN 11729519, each containing 0.6 Ci; and two light sources in fixed cell assembly, PN 11729517, each of which contains 2.2 Ci.

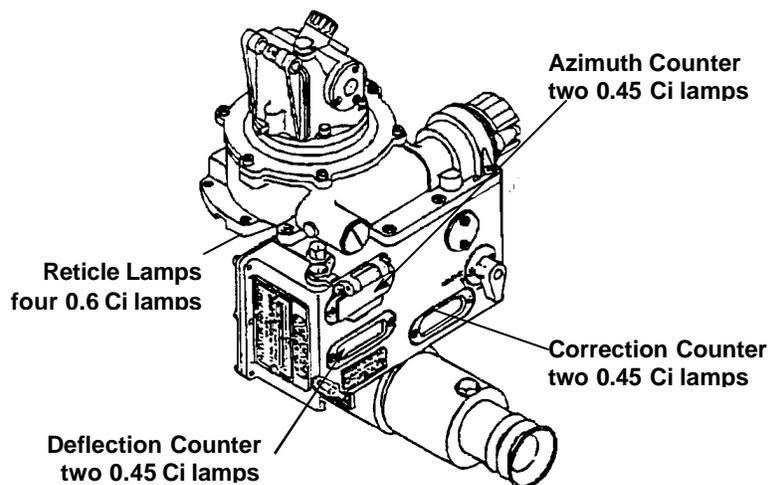


## TRITIUM COMMODITIES (Continued)

- g. **M137 Panoramic Telescope (NSN 1240-01—038-0531)**. Total activity of 5.1 Ci: six light sources in the azimuth, correction, and deflection counters, PN 11730922-2, each containing 0.45 Ci; and four light sources in the reticle, PN11729514, each containing 0.6 Ci.

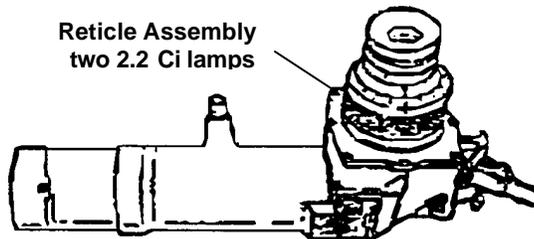


- h. **M137A1 Panoramic Telescope (NSN 1240-01-277-0472)**. Total activity of 5.1 Ci: six light sources in the azimuth, correction, and deflection counters, PN 11730922-2, each containing 0.45 Ci; and four light sources in the reticle, PN 11729514, each with 0.6 Ci.

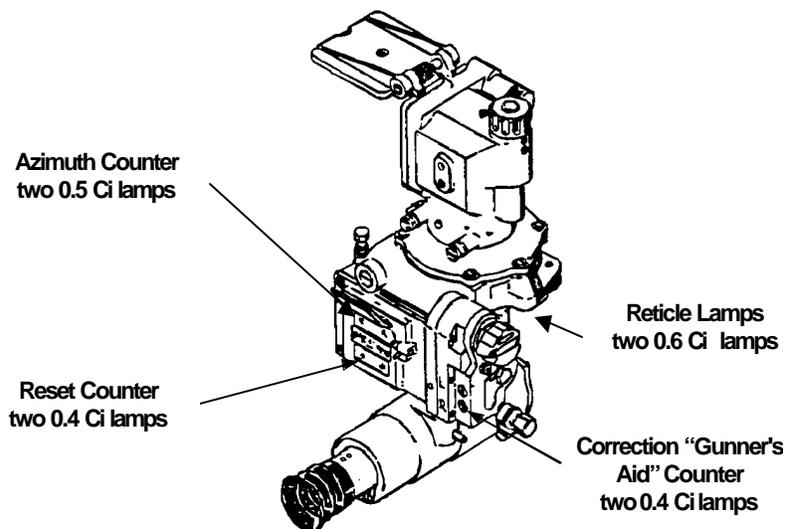


## TRITIUM COMMODITIES (Continued)

- i. **M138 Elbow Telescope (NSN 1240-01-038-0530).** Total activity of 4.4 Ci: two light sources in the reticle, PN 11748012, each containing 2.2 Ci.

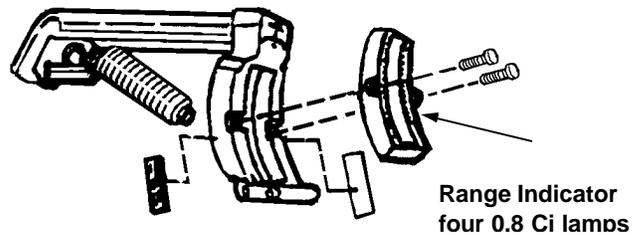


- j. **M113A1 Panoramic Telescope (NSN 1240-00-150-8886).** Total activity of 3.80 Ci: two light sources in the azimuth counter, PN 11730922-3, each with 0.5 Ci; two sources in the reset dials, PN 11730922-1, with 0.4 Ci each; two sources in the reticle, PN 10556228, with 0.6 Ci each; and two light sources in the correction counter, PN 11730273, each with 0.4 Ci.

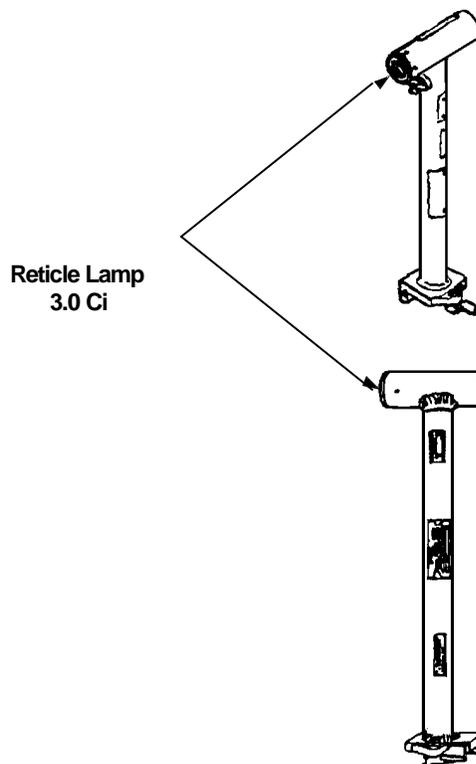


## TRITIUM COMMODITIES (Continued)

- k. **M224 Mortar, 60mm, Range Indicator (NSN 1010-01-020-5626).** Total activity of 3.2 Ci. Used to determine rough range estimates for the lightweight mortar. This device contains four tritium lamps containing 0.8 Ci each. If the molded plastic range indicator is stuck in the holder, Do Not attempt to pry from the holder. (see GPM TACOM-RI Control number 99-01)

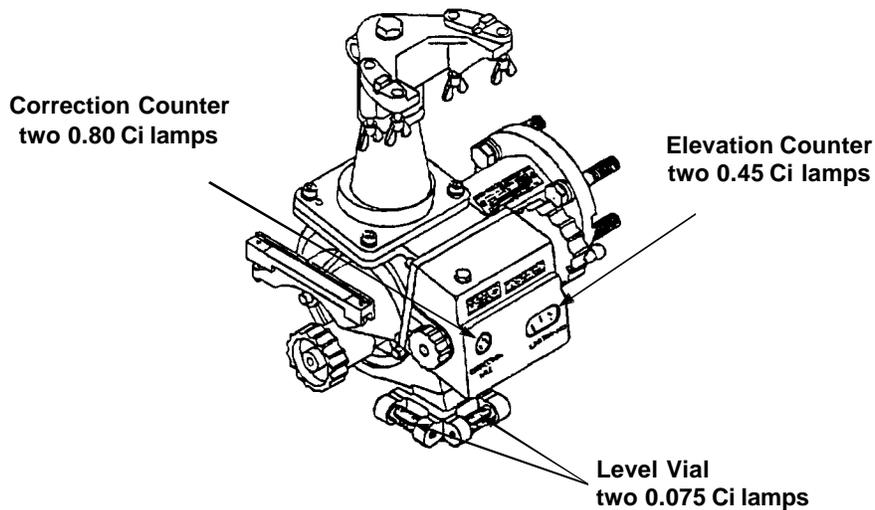


- l. **M139 (NSN 4931-01-048-5834)/M140 (NSN 4931-01-187-9713) Alignment Devices** use a light source, PN 10544163, containing 3.0 Ci of Tritium to align sights with gun tubes. It is considered support equipment for the howitzer and is not mounted except while performing alignment procedures.

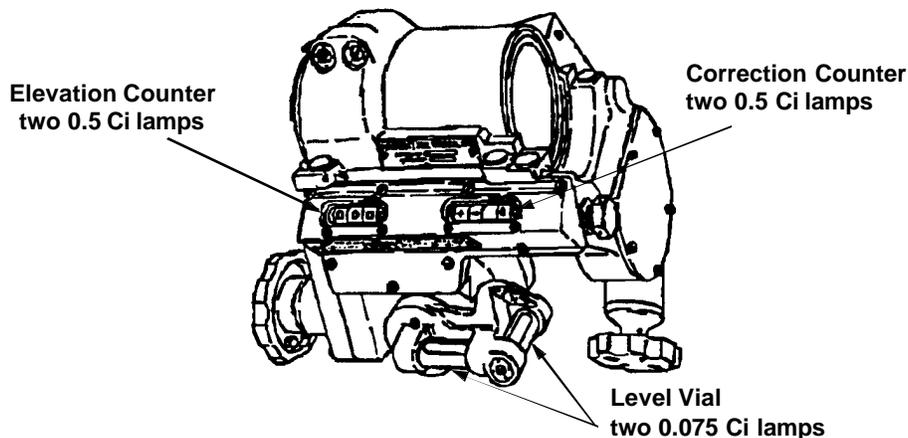


## TRITIUM COMMODITIES (Continued)

- m. **M187 Telescope Mount and Quadrant (NSN 1240-01-277-0474).** Total activity of 2.65 Ci: two light sources in the elevation counter, PN 11730922-2, each containing 0.45 Ci; two light sources in the correction counter, PN 10556228, each containing 0.80 Ci; and two level vials, PN 11729510-2, with 0.075 Ci each.

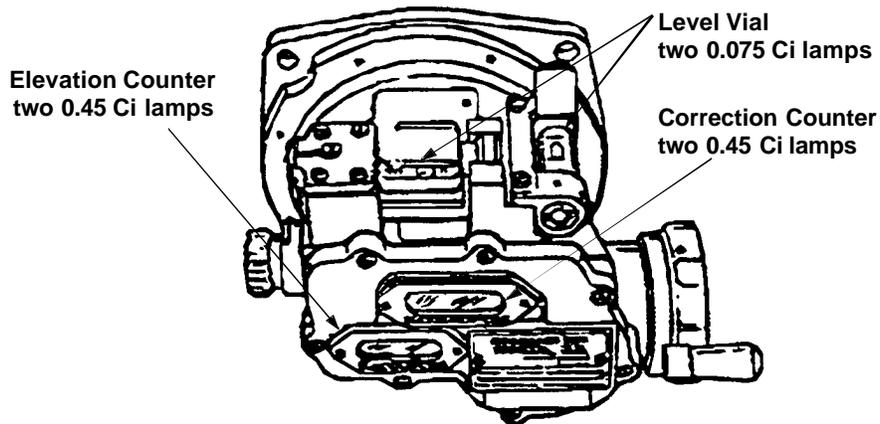


- n. **M14A1 Fire Control Quadrant (NSN 1290-00-150-8891).** Total activity of 2.15 Ci: two level vials, PN 11729510-2, with 0.075 Ci; and four light sources in the elevation (2) and correction (2) counters, PN 11730922-3, with 0.5 Ci each.

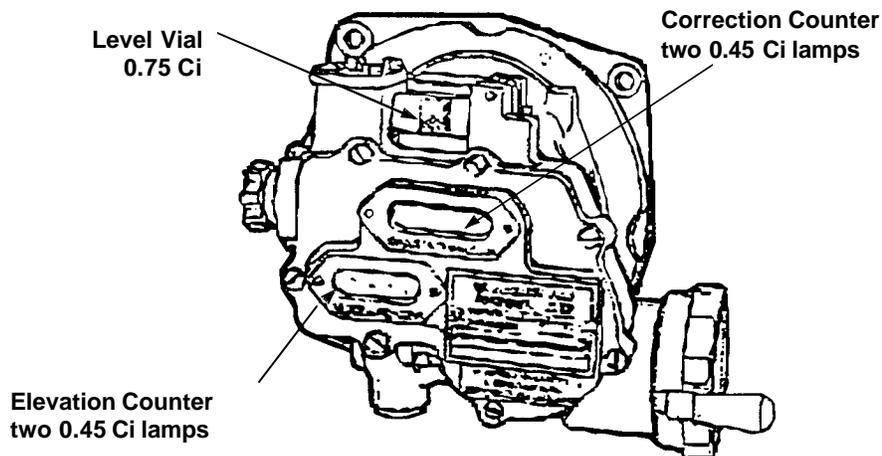


## TRITIUM COMMODITIES (Continued)

- o. **M18 Fire Control Quadrant (NSN 1290-01-037-7289).** Total activity of 1.95 Ci: two level vials, PN 11729510-2, with 0.075 Ci each; and four light sources in the elevation (2) and correction (2) counters, PN 11730922-2, each with 0.45.

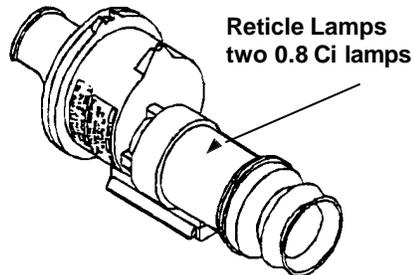


- p. **M17 Fire Control Quadrant (NSN 1290-01-037-3883).** Total activity of 1.875 Ci: one level vial, PN 11729510-2, with 0.075 Ci; and four light sources in the elevation (2) and correction (2) counters, PN 11730922-2, each with 0.45 Ci.

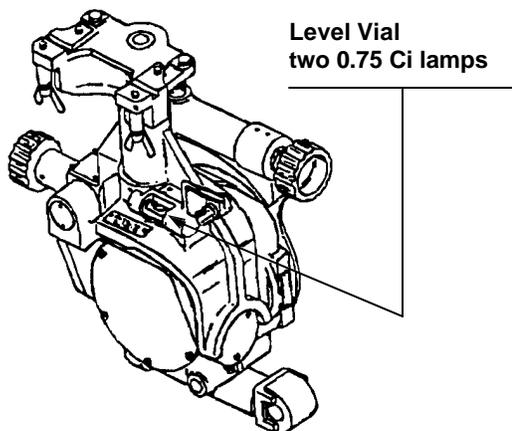


## TRITIUM COMMODITIES (Continued)

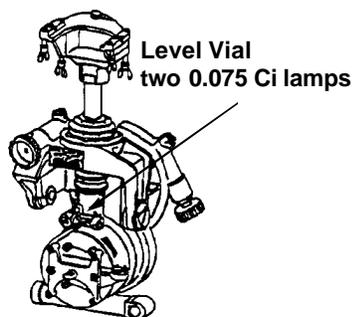
- q. **M90A2 Straight Telescope (NSN 1240-01-277-2875).** Total activity of 1.60 Ci: two light sources, PN 10556228, with 0.80 Ci each.



- r. **M134A1 Telescope Mount (NSN 1240-00-150-8890).** Total activity of 0.15 Ci contained in two level vials with 0.075 Ci each.

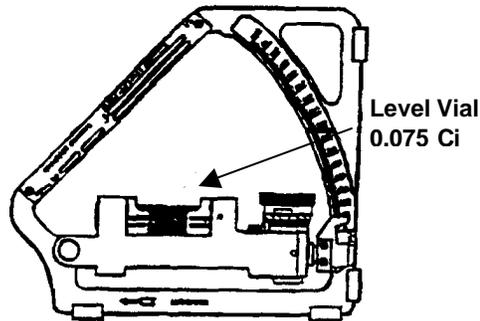


- s. **M171 Telescope Mount (NSN 1240-01-039-7273).** Total activity of 0.15 Ci, two level vials, PN 11729510-2, with 0.075 Ci each.

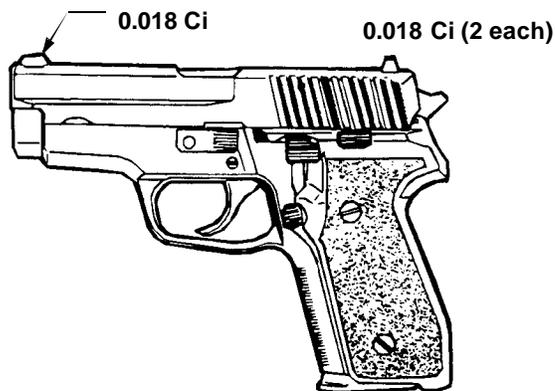


## TRITIUM COMMODITIES (Continued)

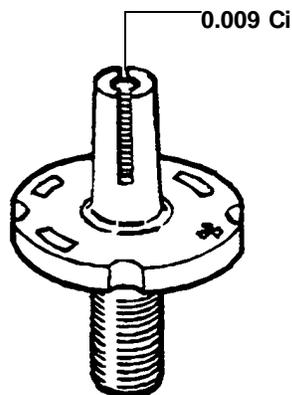
- t. **M1A2 Gunner's Quadrant (NSN 1290-00-169-1937).** Total activity does not exceed 0.075 Ci.



- u. **M11 Pistol (NSN 1005-01-340-0096), 9mm - DARA 12-93-01.** Total activity of 0.054Ci: one light source in the front sight and two light sources in the rear sight. Each light source contains 0.018 Ci.

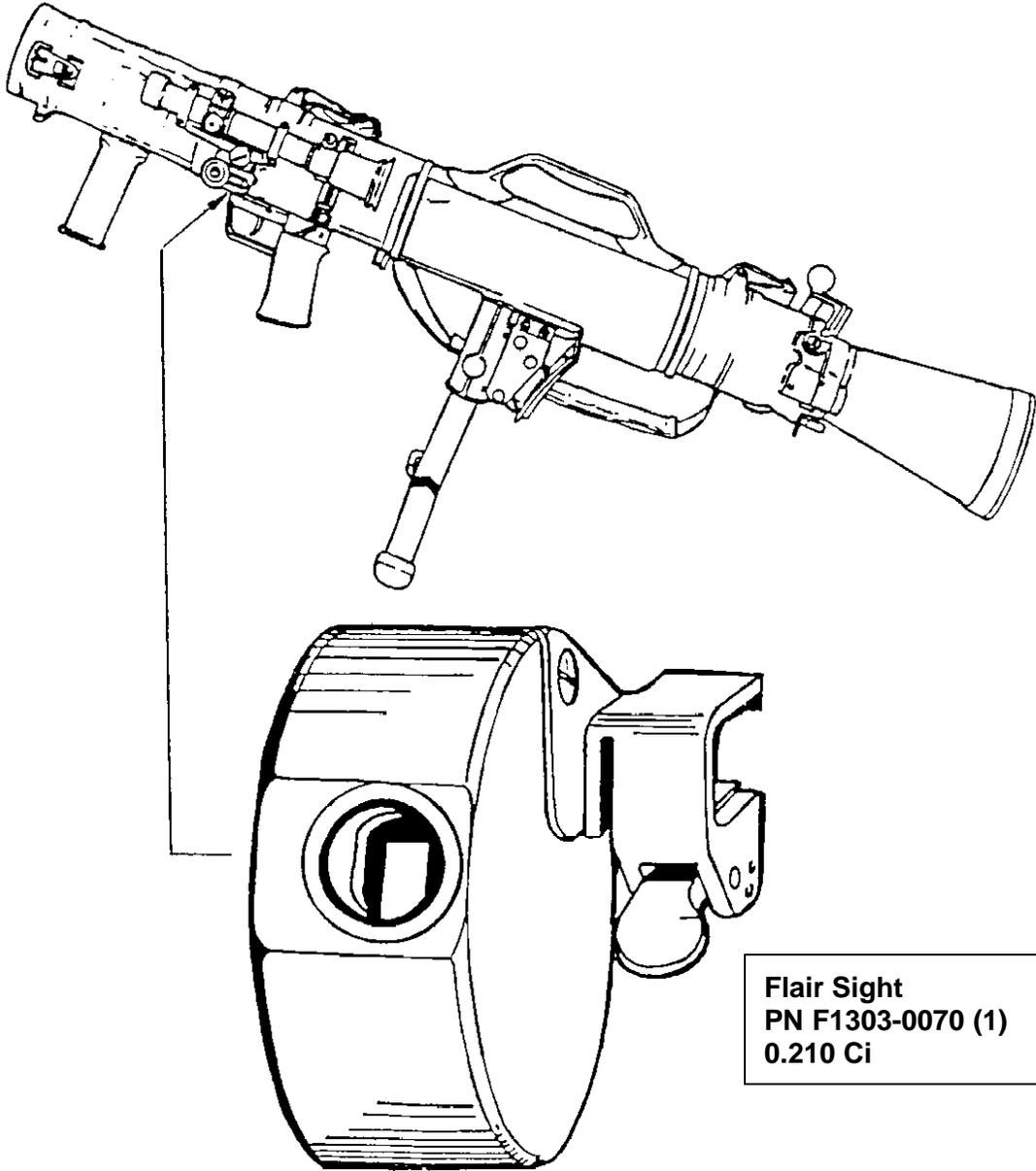


- v. **M16A1 Rifle Front Sight Post.** This item is obsolete. For collection as Rad Waste ONLY! To be removed by authorized repair facility only.



TRITIUM COMMODITIES (Continued)

- w. **M3 RECOILESS RIFLE. Ranger Anti-Armor Anti-Personnel Weapon System (RAAWS) Sights.** Total activity per rifle does not exceed 0.210 Ci.



Flair Sight  
PN F1303-0070 (1)  
0.210 Ci

## TRITIUM COMMODITIES (Continued)

---

### 3-2. EMERGENCY PROCEDURES.

#### a. Damaged Tritium Device.

If a tritium source or device containing tritium is damaged, broken, or fails to illuminate, take the following steps immediately:

- (1) Inform all personnel to vacate the area and restrict access.
- (2) Turn off the central air conditioning (heat, ac, HVAC).
- (3) Open all windows to the outside and turn on any exhaust fans that vent directly outdoors.
- (4) Personnel handling the device should wear rubber or latex gloves. They should also put on any available PPE, or as specified in the SOP.
- (5) The device must be immediately double bagged in plastic. The outside bag or container must be labeled "Broken Tritium Device-Do Not Open." Store the broken device in an outside, weather protected, secured container. Later, contact the supply item manager of the damaged equipment for disposition instructions.
- (6) Dispose of all PPE as radioactive waste per the IRSO's instruction and wash hands for at least two minutes.
- (7) Complete an Incident Reporting Worksheet and an Incident Report Checklist. (see Appendix A)
- (8) Call the Installation RSO at extension \_\_\_\_\_. Installation RSOs call the TACOM-RI RSO at DSN 793-2965, 6228, or 2995.
- (9) The responding RSO should determine, in coordination with medical personnel, if anyone who may have handled a damaged or broken tritium device should report to the health clinic for a tritium bioassay.

#### b. Damaged MRS/M1 Series Tank Gun Tube.

In the event that an M1 series tank sustains damage to the main gun tube (i.e., blown gun tube or significant impact to the tube) and the muzzle reference sensor (MRS) could have been damaged, treat the MRS and end of the main gun tube (even if the MRS is no longer attached) as if contaminated and take the following actions:

- (1) Whether the MRS is attached or not, avoid any contact with the end of the gun tube.
- (2) Notify the Installation RSO.

## TRITIUM COMMODITIES (Continued)

---

- (3) If the MRS has separated from the gun tube, collect and double bag all the pieces and label damaged tritium device. Wear latex or rubber disposable gloves or use bag to pick up the pieces so as to minimize contact with any contaminated parts. Wash your hands with non-abrasive soap after picking up the pieces.
- (4) In coordination with the RSO, have the proper level maintenance personnel remove the MRS from the gun tube, if damaged, and double bag the MRS. Label the outer bag as “DAMAGED TRITIUM DEVICE - DO NOT OPEN.”
- (5) Wipe tests should be taken on the gun tube and the MRS (if not removed) to determine the extent of any possible contamination.
- (6) Notify the item manager, and the TACOM-RI License Staff, as to the condition of the MRS and to receive disposition instructions.
- (7) Damaged or non-illuminated MRS's are to be treated as radioactive waste.

### **c. Special Bioassay Requirements For Personnel Exposed To Tritium.**

- (1) Bioassays are the method for determining a tritium uptake and measuring the potential dose from the exposure. External dosimetry is ineffective for the low energy Beta given off by tritium decay. A bioassay may be necessary for individuals in the immediate vicinity of an actual or suspected release of Tritium. Potentially exposed individuals include users, DS/GS level maintenance, and depot workers. The RSO will make this determination on a case-by-case basis, in coordination with medical personnel.
- (2) Individuals determined to need a bioassay following a suspected exposure to Tritium, must be referred to a medical facility.
- (3) The minimum time prior to collecting a bioassay sample after an exposure event is 4 hours. Optimum results are obtained when urine samples are taken 4 hours after the suspected exposure because Tritium takes approximately 4 hours to reach equilibrium throughout human body fluids.
- (4) Following exposure and prior to providing a urine sample for bioassay, the individual(s) should void his/her bladder to ensure an accurate bioassay.
- (5) The results of the bioassay must indicate the exposure in terms of Committed Effective Dose Equivalent (CEDE), be documented, and reported to the TACOM-RI License Staff.

## TRITIUM COMMODITIES (Continued)

---

- (6) For information on bioassay procedures and to receive bioassay kits, contact the US Army Center for Health Promotion and Preventive Medicine at DSN 584-3548 or COM (410) 436-3548 and FAX DSN 584-8261 or COM (410) 436-8261.

### d. Decontamination

- (1) Put on the appropriate level of PPE as specified by the RSO or SOP.
- (2) Determine the size and shape of the contaminated area using surface wipes. Perform wipes using wipe procedures in Section V of this document. Wipes must be counted on a calibrated scintillation counter at an authorized counting lab. Be sure to include air ducts and fume hoods.
- (3) Use citrus based cleaning agents or diluted hydrogen peroxide to clean Tritium contamination. Contact the TACOM-RI License Staff for application directions.
- (4) Decontaminate from the outer edge inward toward the center or wall. Avoid splattering and circular motion.
- (5) Resurvey the area.
- (6) Repeat steps 3 through 5, as necessary, until contamination levels are below acceptable limits.

### 3-3. INCIDENT REPORTING

Due to the stringent reporting requirements placed on TACOM-RI by the Nuclear Regulatory Commission, **all instances of lost, stolen, or broken fire control devices containing Tritium must be reported to the TACOM-RI RSO through the chain of command, immediately upon discovery.**

### 3-4. SAFE HANDLING PROCEDURES

**Illumination Test For Tritium Devices.** No routine maintenance action can be performed on devices that contain tritium if it is suspected that the Pyrex tube containing the tritium gas has been broken or is leaking. Lack of illumination or diminished illumination is an indication that the source may be damaged.

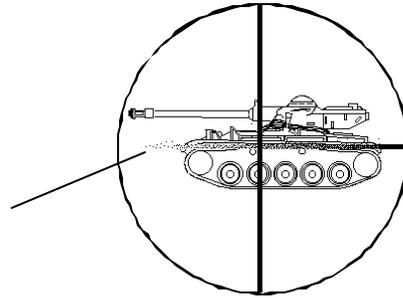
To test for illumination of the light source, place the device in a dark place for a minimum of 2 hours to ensure that the phosphor agent is not being activated by an outside light source. View the device in low light after your eyes have become accustomed to the dark. If there is no evidence of illumination or the illumination appears diminished, consider the light source to be broken, double bag it and turn it in to the RSO for disposition.

## TRITIUM COMMODITIES (Continued)

---

While performing the illumination test, make sure that all light sources are illuminated. Some reticles have more than one tritium light source. If one of the light sources for a reticle is damaged, the reticle pattern may appear to be dim in only that region.

The Tritium light source for this portion of the reticle may be damaged.



### Maintenance Of Fire Control Devices Containing Tritium.

If a fire control device requires maintenance in the areas that contain tritium, **check the TM to see if you are authorized to perform the maintenance.** Follow all radiation safety instructions and precautionary measures contained in sections of the TM. **Opening the components that contain broken or damaged tritium sources will release tritium oxide and the work area will be contaminated.**

If a tritium light source is broken or damaged while it is still contained in the fire control device some of the tritium gas may be released into the interior of the device. In this confined space the gas does not dissipate into the atmosphere but has a tendency to combine with the available oxygen molecules to form significantly more tritium oxide. When contained like this, tritium, being a very small molecule, will leach into the metal and other materials it contacts in the interior of the device creating an additional contamination hazard.

Before performing ANY maintenance procedures on devices that contain tritium light sources, perform an illumination test to determine whether all tritium sources contained in the device are properly illuminated. If any light source is not illuminated, it must be considered broken and field level personnel **cannot** perform further maintenance on it. Immediately double bag the device, contact your local RSO for proper disposition instructions, and isolate the area until wipes are taken and contamination levels determined

Maintenance areas where work is routinely performed on fire control devices must have monthly wipe surveys of all work surfaces. All workbenches and tables must be covered with Kraft paper, or other removable, protective material during maintenance procedures. In addition, all personnel that work in these facilities will have baseline tritium bioassays. Refer to the Section 5, RADIATION SAFETY PROGRAM, for more information.

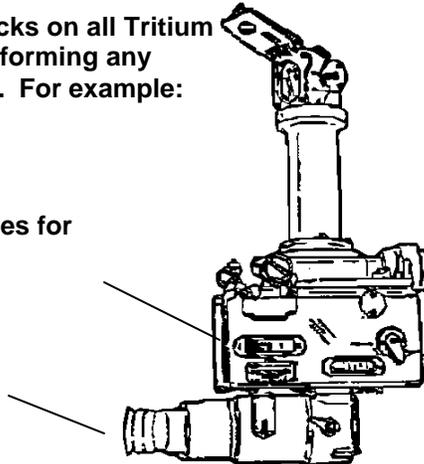
## TRITIUM COMMODITIES (Continued)

---

Perform illumination checks on all Tritium light sources prior to performing any maintenance procedures. For example:

Examine all Six light sources for the scale counters

Examine all Four reticle light sources



**Desiccant Change-out.** When changing the desiccant in MRS units, always wear latex gloves. The interior of the MRS may be contaminated due to leakage of the tritium cell module (beam splitter). Do not attempt to dry the interior of the MRS if moisture is present. It is likely that this moisture is contaminated with tritium and your actions will spread the contamination. **Always dispose of desiccant, gloves and other used materials as radioactive waste according to Maintenance Advisory Message (MAM), TACOM-WRN number 98-13 (see App. G.) and the IRSO's instructions.**

## SECTION IV. AMERICIUM 241 COMMODITIES

### SECTION INDEX

	Para	Para
1. Introduction.....	4-1	4-1
2. Responsibilities.....	4-1	4-2
3. Transaction Reporting.....	4-3	4-2

#### 4-1. DEVICE DESCRIPTION

##### **M43A1 Chemical Agent Detector Unit (NSN 6665-01-081-8140)**



**Figure 4-1**  
M43A1 Chemical Agent Detector

The M43A1 Chemical Agent Detector Unit is a component of the M8A1 alarm system (NSN 6665-01-105-5623). Developed in the late 1970's early 1980's, this detector uses a radioactive source to detect the presence of nerve agents in the air (vapor).

One of the three major components of the M43A1 detector unit is the detector cell assembly or the cell module (NSN 6665-01-114-0073). The cell module of the M43A1 detector unit contains a radioactive sealed source with a maximum of 300 microcurie ( $\mu\text{Ci}$ ) Americium-241 ( $\text{Am-241}$ ). The radioactive material (see figure below) is contained within the detector unit's cell module and disassembly of the cell module is not authorized at any level of maintenance.

## AMERICIUM 241 COMMODITIES (Continued)

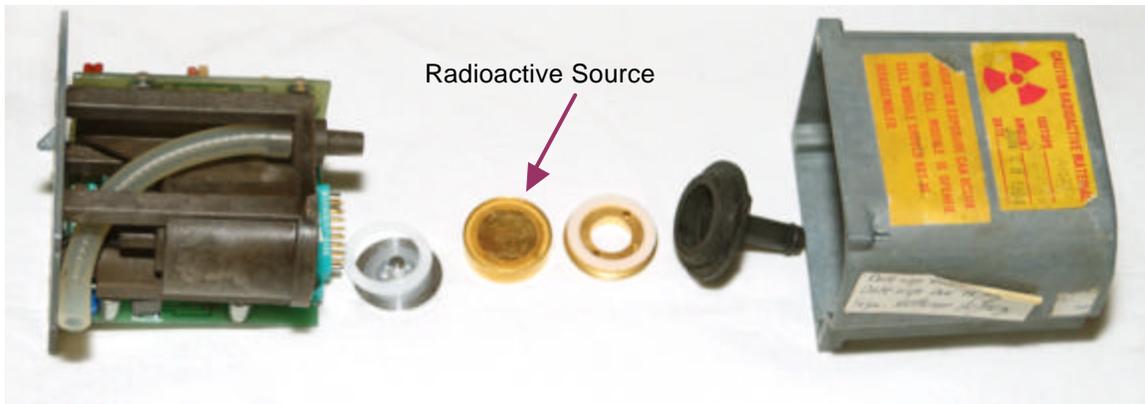


Figure 4-2.  
Expanded View of Detector Cell

The sealed source model designation is NRD, Inc. foil source, Model A-001, and is 16mm in diameter. The 300  $\mu\text{Ci}$  of Am-241 is an oxide that is uniformly distributed and sintered in a gold or silver matrix, layered between two inactive margins of silver or gold. The foil is then plated with yellow gold, white gold or palladium. The foil is less than 1/100<sup>th</sup> of an inch thick and not accessible without taking apart the cell module. ***Disassembly of the cell is not authorized at any level of maintenance.***

The cell module is considered a “special form” source because it meets the criteria for a special form Class 7 (radioactive material) as outlined in 49 CFR 173.403). A special form source must pass rigorous environmental and accident situations without damage or leakage and is expected to remain intact throughout its life cycle. A copy of the special form certificate is available from the SBCCOM Radiation Protection Office and must be maintained by any person acting as a shipper of this item in commerce (commercial carrier shipment).

### 4-2. EMERGENCY PROCEDURES

Radioactive contamination, exceeding the established action levels, has been detected in a small percentage of M43A1 Chemical Agent Detectors.

If an area survey indicates positive contamination, a report of a failed leak test is received, if during maintenance any powder is observed in the nonmetallic tubing, or the device is damaged during training whereas the integrity of the interior contents is in question:

- a. Secure the device and restrict area access.
- b. Put on the appropriate level of personal protective equipment (PPE) as specified by Standing Operating Procedure (SOP) or your RSO. *Typically only the use of disposal gloves will be required.* If contamination is verified, PPE will be

## AMERICIUM 241 COMMODITIES (Continued)

---

disposed of as radioactive waste. If further surveys indicate the lack of contamination, the PPE may be disposed of as normal trash.

c. Immediately place the M43A1 in double plastic bags (preferable clear), seal and label **“DAMAGED AMERICIUM-241 DEVICE – DO NOT OPEN”**. The bags should be sealed individually with the first bags sealed and placed into the second bag and that bag sealed and labeled.

d. Store and dispose of item as radioactive waste. *At the unit level the item will be transferred to the IRSO.* TACOM-RI may request that the item be retain and/or shipped to a different facility to permit investigation of the failure.

e. Complete an Incident Reporting Worksheet and an Incident Report Checklist (App A, pages 3 and 4).

f. Call the IRSO at extension \_\_\_\_\_. IRSOs call the TACOM-RI Radiation Safety Office at DSN 793-2965/6228 or Commercial (309) 782-2965/6228. **DO NOT PERFORM ANY MAINTENANCE ON THE DEVICE.**

g. Ensure that the hand receipt is adjusted to indicate disposal of the device and submit the proper RATTs transaction to the Source Serialization Officer.

### 4-3. INCIDENT REPORTING

**Report all instances of damaged, lost, or stolen M43A1 Chemical Agent Detectors to the TACOM-RI License Staff immediately.** The Nuclear Regulatory Commission has placed stringent reporting requirements on TACOM-RI that necessitate everyone's full cooperation.

### 4-4. SAFE HANDLING PROCEDURES

Deterioration of the Am-241 source can occur in the form of small cracks similar to “heat checking.” In the most severe cases these cracks may penetrate the source covering, allowing moisture from the air to contact the Americium oxide causing it to plate out onto the outer surface of the covering. Continued use of a device with a deteriorated source will cause this contamination to migrate through the air path. The contamination will appear as a powder found in the plastic tubing between the pump module and the cell module. Owners and maintenance personnel of this equipment have been alerted to take the following actions:

a. Ensure all operators and maintainers are reminded that use of the outlet filter is **mandatory** when the M43A1 is used indoors or any other closed space, such as, a vehicle or maintenance trailer.

b. Ensure strict adherence to the procedures in the technical manuals regarding wearing gloves, use of Kraft paper or other removable covering on workbenches,

## AMERICIUM 241 COMMODITIES (Continued)

---

and monitoring the area with an alpha meter, such as the AN/PDR-77, when maintenance is being performed. **If you see any powder in the pump tubing immediately place the device in double bags, seal and store. DO NOT PERFORM ANY MAINTENANCE ON THE DEVICE.** Contact your installation RSO for further instructions.

c. Ensure that maintenance activities strictly adhere to the wipe tests procedures prior to any maintenance activity. The results of a maintenance wipe must be received from the Rock Island Radiation Laboratory, or other laboratories authorized by the licensee (i.e. CECOM Laboratory for ARNG maintenance activities only), prior to the start of any maintenance conducted at the DS maintenance level.

## SECTION V. NICKEL 63 COMMODITIES

SECTION INDEX		
	Para	Page
Device Descriptio5-1 .....	5-1	5-1
Emergency Procedures .....	5-2	5-3
Incident Reporting Requirements.....	5-3	5-3
Safe Handling Procedures .....	5-4	5-3

### 5-1. DEVICE DESCRIPTIONS AND LOCATIONS

Developed in the 1980's, the Chemical Agent Monitor (CAM) is a hand held monitoring tool capable of detecting and discriminating between mustard and nerve agent. In 1993 an Improved Chemical Agent Monitor (ICAM) was standardized improving reliability, reducing maintenance cost and eliminating the need for depot maintenance. The CAM/ICAM is used for monitoring agent contamination on personnel and equipment. Each monitor contains a single drift tube module identified by NSN 6665-01-380-8449, NSN 6665-01-383-6257, or NSN 6665-99-257-0069. The CAM and ICAM are identical in appearance.

Nickel 63 (Ni-63) is authorized for use in the drift tube module contained in Chemical Agent Monitors (CAMs) (NSN 6665-01-199-4153) and the Improved Chemical Agent Monitors (ICAMs) (NSN 6665-01-357-8502). A version issued to the Canadian Army is also seen in the Army's supply system carried under NSN 6665-21-904-3229. Each drift tube module cell contains a maximum of 15 millicuries (15 mCi) of Ni-63 plated on a brass foil cylinder inside a Teflon housing that is installed in a larger aluminum alloy cylinder.



Figure 5-1.  
Chemical Agent Monitor (CAM)/Improved Chemical Agent Monitor (ICAM)

## NICKEL 63 COMMODITIES (Continued)

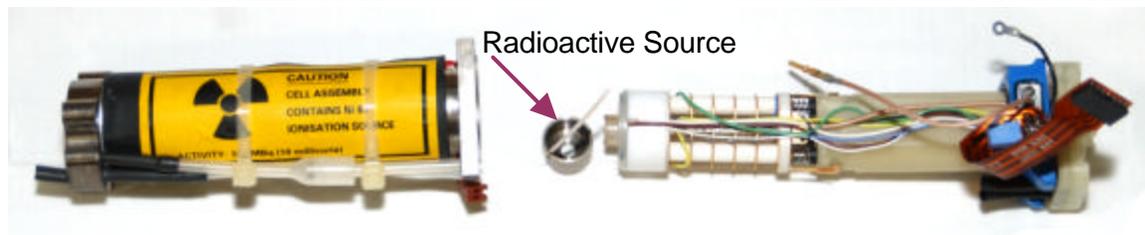


Figure 5-2.  
Expanded View of Drift Tube Module

Another design that began in the 1980's, as a replacement for the M43A1 alarm is the M88 Chemical Agent Detector Unit, this system detects both nerve and mustard agent vapor simultaneously. It is more sensitive than the M43A1 and less susceptible to interference. Also known as the GID-3, the M88 Chemical Agent Detector (NSN 6665-01-199-3673) is a component of the M22 Automatic Chemical Agent Alarm system (NSN 6665-01-438-6963), also referred to as the M22 ACADA. The M22 ACADA detects chemical warfare agents in the air and gives a warning that can be heard or can be transmitted by telephone wires to an M42 alarm. The ACADA also gives visual warning and identifies hazardous levels of agent vapor and agent group on a bar display. The M88 Chemical Agent Detector unit contains two drift tube modules. Each drift tube contains a 15 mCi Ni-63 radioactive source for a total of 30 mCi of activity.



Figure 5-3  
M88, Chemical Agent Detector Unit

## NICKEL 63 COMMODITIES (Continued)

---

### 5-2. EMERGENCY PROCEDURES

If an area survey indicates contamination or a report of a failed leak test is received:

- a. Secure the device and restrict area access.
- b. Put on the appropriate level of personal protective equipment (PPE) as specified by Standing Operating Procedure (SOP) or your RSO. *Typically only the use of disposal gloves will be required.* If contamination is verified, PPE will be disposed of as radioactive waste. If further surveys indicate the lack of contamination, the PPE may be disposed of as normal trash.
- c. Immediately place the device in double plastic bags (preferable clear), seal and label **“DAMAGED NICKEL-63 DEVICE – DO NOT OPEN”**. The bags should be sealed individually with the first bags sealed and placed into the second bag and that bag sealed and labeled.
- d. Store and dispose of item as radioactive waste. *At the unit level the item will be transferred to the IRSO.* TACOM-RI may request that the item be retain and/or shipped to a different facility to permit investigation of the failure.
- e. Complete an Incident Reporting Worksheet and an Incident Report Checklist (App A, pages 2 and 3).
- f. Call the IRSO at extension \_\_\_\_\_. IRSOs call the TACOM -RI Radiation Safety Office at DSN 793-2965/6228 or Commercial (309) 782-2965/6228. **DO NOT PERFORM ANY MAINTENANCE ON THE DEVICE.**
- g. Ensure that the hand receipt is adjusted to indicate disposal of the device and submit the proper RATTs transaction to the Source Serialization Officer.

### 5-3. INCIDENT REPORTING REQUIREMENTS

**Report all instances of damaged, lost, or stolen CAMs, ICAMs, and ACADAs to the TACOM-RI License Staff immediately.** The Nuclear Regulatory Commission has placed stringent reporting requirements on the licensee that necessitate everyone's full cooperation.

### 5-4. SAFE HANDLING

- a. No special handling is required for the CAM, ICAM or ACADA. Handling or maintenance on these items must follow SOPs, TMs, and good radiological safety practices. Ensure strict adherence to the procedures in the technical manuals regarding wearing gloves, using Kraft paper or other removable covering on

## NICKEL 63 COMMODITIES (Continued)

---

workbenches, and surveying the area following maintenance as described in Section 6-3. **If you see any rusting in the drift tube area, immediately place the device in double bags (preferable clear), seal and store. DO NOT PERFORM ANY MAINTENANCE ON THE DEVICE.** Contact your installation RSO for further instructions.

b. Ensure that maintenance activities strictly adhere to the wipe tests procedures prior to and after any maintenance function conducted above unit level maintenance operations.

---

## SECTION VI. RADIATION TESTING AND TRACKING SYSTEM (RATTS)

SECTION INDEX		
	Para	Page
Introduction.....	6-1	6-1
Responsibilities .....	6-2	6-1
Transactions Reporting.....	6-3	6-2

### 6-1. INTRODUCTION

In order to ensure compliance with NRC License commitments for the accountability of TACOM-RI commodities, the Army has established a computerized tracking system. This system, based on the Army's tracking system for small arms, is known as the Radiation Testing and Tracking System (RATTS). It is designed to provide strict control and identification of the radioactive sources and the devices they are in for the purpose of source control, user and maintainer safety. This system is a component of the Unique Item Tracking System (UIT) and is implemented by AR 710-3 Section IV.

### 6-2. RESPONSIBILITIES

#### a. Commanders of Major Army Commands.

- (1) Establish RATTS files for installations under their jurisdiction.
- (2) Ensure that serial numbers for both the device and the radioactive source cell are recorded on property records IAW AR 710-2.
- (3) Ensures each installation/geographical area appoints a radioactive source serialization officer (SSO).
- (4) Ensure that the name, address and phone numbers of the SSO is provided to the DA Registry.

#### b. Property Book Officers (PBO).

- (1) Ensure that serial numbers for both the device and the radioactive source cell are recorded on property records IAW AR 710-2.

## RADIATION TESTING and TRACKING SYSTEM (Continued)

---

(2) Ensure changes are reported to the designated SSO as prescribed in AR 710-3.

(3) Reconcile serial numbers as directed by SSO.

### 6-3. Transactions Reporting:

**a. Shipments and transfers** – the reporting activity will submit a report using transaction code “**S**” when a device or radioactive source is shipped or transferred from one accountable property record to another reporting activity. Ensure that the serial number on the transfer paper matches the serial number on the device and the radioactive source shipped.

**b. Receipt** – for devices or radioactive sources received prepare a receipt transaction “**R**” and transmit to the reporting activities file. Ensure that the serial number on the transfer paper matches the serial number on the device and the radioactive source received.

**c. Inventory Gain** – for devices and/or radioactive sources gained through inventory adjustment (i.e., found on installation, previously dropped using “**L**”) prepare and submit transaction report using transaction code “**C**”.

**d. Loss** – devices and/or radioactive sources that have been lost or stolen will be reported using the transaction code “**L**”.

**e. Demilitarization** – devices and/or radioactive sources that are being removed from the inventory to be sent to the radioactive waste program will be reported using a transaction code “**V**”. This code will be used when the detector cells are removed from the property book for disposal purposes only.

**f. Wipe Test** – the radioactive sources within the CAM/ICAM and the M8A1 require annual leak test. The record of these leak tests are managed through the RATTTS system using a “**W**” transaction code.

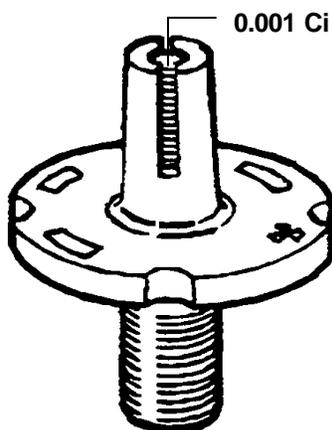
**g. Removal and Insertion** – when a testing activity (maintenance unit) removes an inoperative detector cell from a piece of equipment a transaction code “**X**” will be completed. The testing activity will complete a “**Y**” transaction when a new detector cell is inserted into the piece of equipment.

## SECTION VII. PROMETHIUM 147 COMMODITIES

SECTION INDEX		
	Para	Page
Device Description.....	7-1	7-1
Emergency Procedures .....	7-2	7-1
Incident Reporting Requirements.....	7-3	7-2
Safe Handling Procedures .....	7-4	7-2

### 7-1. DEVICE DESCRIPTION AND LOCATION

**M16A1 Rifle Front Sight Post.** These sights are no longer in use. If a Promethium 147 rifle sight is discovered, have it removed at an authorized maintenance facility. Rifle sights containing Promethium 147 are distinguishable from Tritium sights by the orange glow as opposed to the green Tritium glow.



### 7-2. EMERGENCY PROCEDURES

There are no special emergency requirements for Promethium 147 rifle sights. Follow good radiation practices and procedures set forth in SOPs, TMs and training materials. Treat non-illuminating sights as broken. Double bag the sight and report it to your RSO **immediately**. Promethium sights are to be disposed of as radioactive waste.

### 7-3. INCIDENT REPORTING REQUIREMENTS

**Report all instances of damaged, lost, or stolen Promethium 147 rifle sights to the TACOM-RI License Staff immediately.** The Nuclear Regulatory Commission has placed stringent reporting requirements on TACOM-RI that necessitate everyone's full cooperation.

## PROMETHIUM 147 COMMODITIES (Continued)

---

### 7-4. SAFE HANDLING PROCEDURES

If any Promethium sights are found, they should be double bagged in plastic and disposed of as radioactive waste.

## SECTION VIII. RADIATION SAFETY PROGRAM

### SECTION INDEX

	Para	Page
Radiation Safety Committees and ALARA Concepts .....	8-1	8-1
Training Requirements.....	8-2	8-3
Control Of Radioactive Commodities .....	8-3	8-4
Inspections .....	8-4	8-14
Radioactive Waste .....	8-5	8-14

### 8-1. RADIATION SAFETY COMMITTEES AND ALARA CONCEPTS

- a. AR 11-9 states that an installation commander may establish a Radiation Safety Committee (RSC). The RSC is the installation commander's advisory body established to gather and disseminate information about the installation radiation safety program. It is the committee's responsibility to bring radiation safety concerns to the attention of the installation commander. It is also the responsibility of the committee to recommend tools, procedures, and controls that will maintain installation radiation exposures "as low as reasonably achievable" (ALARA). One method of accomplishing this is for the RSC to perform a root cause analysis of incidents and exposures. Once the cause has been determined, corrective actions can be implemented to prevent future radiation incidents and exposures. The committee shall also review dosimetry and bioassay data to identify exposure trends.

Membership should include all installation tenants and should include, but not be limited to, the following personnel:

- (1) Commander or his representative;
  - (2) All Installation, Tenant and Unit Radiation Safety Officers;
  - (3) Medical Officer;
  - (4) Safety Officer;
  - (5) Appropriate representation for units and activities possessing, using or maintaining commodities containing radioactive material.
  - (6) Representatives of employee organizations and labor unions.
- b. The Installation Radiation Safety Committee shall meet at least annually.
- c. Each individual is responsible for keeping his or her exposure and dose ALARA. Knowing and following general rules of safety when handling

## RADIATION SAFETY PROGRAM (Continued)

---

commodities containing radioactive sources accomplish this. Users of Army radioactive commodities and personnel whose duties include working with radioactive materials should review and abide by the following basic safety tenets.

- (1) Each individual is responsible for knowing and understanding specific area requirements, such as area posting requirements, use of personnel protective equipment and specified maintenance procedures.
- (2) Each individual is responsible to be knowledgeable of Material Safety Data Sheet information regarding radioactive commodities used, maintained or stored in the area.
- (3) Personnel must NEVER deliberately breach or degrade a radioactive source, or violate safe handling and maintenance instructions developed to assure continuing integrity of sealed sources. All commodities containing a radioactive source will be marked with a trefoil. (see drawing)



**Radiation Trefoil**

- (4) Avoid contacting nose, mouth, eyes and ears, with one's hands while working with radioactive material or in a radiologically controlled area such as maintenance and storage areas. Any open wound(s) must be covered prior to entering a controlled area.
- (5) Smoking, eating, drinking, applying cosmetics, or chewing gum or tobacco within a radiologically controlled area SHALL be prohibited.
- (6) Always wash hands with *non-abrasive* soap and *cool water* after handling radioactive materials or sources.
- (7) Dispose of potentially contaminated waste materials in appropriately labeled containers only. **NEVER dispose of potentially radioactive waste in clean trash.**
- (8) Report ALL injuries to supervision. Proper medical attention MUST take precedence over any other consideration and seriously injured individuals should be removed under the supervision of medical personnel.
- (9) Local emergency response authorities should be informed of radiological inventories, handling operations and respective storage and

## **RADIATION SAFETY PROGRAM (Continued)**

---

maintenance locations. Emergency response protocols should be in place, functional, and tested periodically.

### **8-2. TRAINING REQUIREMENTS**

#### **a. NRC Licensed Commodity Users**

Users of licensed commodities are authorized possession, use and performance of operational checks and services only as specified in the unit level technical manuals. Users must comply with the procedures noted in applicable Technical Manuals. Users must also comply with all warnings and postings in storage and maintenance areas.

TRADOC schools have incorporated a radioactive material awareness and radiation safety segment into Military Occupational Skills (MOS) training for users and maintainers of licensed commodities. The TACOM-RI License Staff; Directorate for Safety, U.S. Army CECOM; or the IRSO are available to provide radiation safety training for personnel using TACOM-RI licensed commodities.

#### **b. Maintainers**

Direct Support Maintenance personnel must receive initial radiation safety training that includes safe handling procedures, survey procedures, specific hazards, leak testing, and emergency procedures. The shop supervisor and unit commander are responsible for each maintenance worker job proficiency and annual proficiency evaluation. Records of training and evaluation must be maintained by the shop supervisor and unit commander and made available for review by the RSO and TACOM-RI License Staff.

Depot-level maintenance personnel receive awareness training from the Depot RSO prior to the assuming maintenance duties. In addition to Direct Support Maintenance training, depot maintenance training must include:

- (1) Emergency Procedures and Incident Notification Procedures,
- (2) Safe working techniques and proper use of protective equipment, and
- (3) Proper transportation procedures.

#### **c. Installation and Depot Radiation Safety Officers**

- (1) The Installation Radiation Safety Officer (IRSO) is required to have formal radiation safety training prior to assuming the responsibilities of IRSO. This training can be received from the US Army Chemical School, the Army Medical Department Center and School, or equivalent military or civilian radiation training provider or school. Navy personnel who have completed the RASO, RSO training in Yorktown, VA may also

## RADIATION SAFETY PROGRAM (Continued)

---

conduct the training. The U.S. Army Communications Electronics Command (CECOM), Directorate of Safety Risk Management "Radiation Safety Officer Training Course" and the TACOM-RI Safety Office "Radioactive Material Handling Safety Course" are also adequate to provide this training. The training must include biological effects, specific hazards of isotopes, emergency procedures, detection and measurement of radioactivity, calculations, and good radiation program practices for storage, monitoring, decontamination and disposal. The IRSO is required to have refresher training via 'live training' or internet based training and interactive compact disk (CD) training provided through TACOM-RI or CECOM. Contact the TACOM-RI License Staff for details.

- (2) The Depot RSO is required to have a minimum of 80 hours of training in the following areas:
  - (a) Principles and Practices of radiation protection;
  - (b) Radioactivity measurement standardization, monitoring techniques, and instrumentation;
  - (c) Mathematics and calculations basic to the use and measurement of radioactivity; and
  - (d) Biological effects of radiation.
- (3) Activity and Unit RSO's (TRSO, URSO) are required to attend the TACOM-RI "Radioactive Material Handling safety" course or the CECOM "Radiation Protection Officer Course."

### 8-3. CONTROL OF RADIOACTIVE COMMODITIES

#### a. Depot Storage.

- (1) Depot-level storage, or bulk storage, of **Tritium** fire control devices must be specifically authorized by TACOM-RI License Staff and meet the following criteria:
  - (a) Surveys. Area wipe tests must be performed quarterly.
  - (b) Air Monitoring. A tritium air monitor is required for each fire control device bulk storage location. Alarms must be set to alarm at no higher than  $5 \times 10^{-6}$  microcuries/ml.
  - (c) Storage. A fireproof wall or a separation distance of 10 feet must separate each bulk storage quantity of 10,000 curies. Licensed devices must be stored in rooms, buildings, or caged areas designated for storage of radioactive items. Storage areas must be

## RADIATION SAFETY PROGRAM (Continued)

---

located in an area that is free from flooding and away from the effective radius of flammables and explosives.

- (2) Depot level storage of **Non-Tritium** licensed commodities is authorized at the Rock Island Arsenal, Rock Island, Illinois and at the Blue Grass Depot, Richmond, Kentucky. TACOM-RI License staff may authorize additional Depot level storage locations if they meet the following criteria:
  - (a) Storage. Licensed devices must be stored in rooms, buildings, or caged areas designated for storage of radioactive items. There is no storage limit regarding the number of Am-241 or Ni-63 commodities permitted in a storage area. However, the storage areas must be located in an area that is free from flooding and away from the effective radius of flammables and explosives.
  - (b) Surveys. Storage areas must be wipe tested quarterly. Wipe tests must be analyzed on equipment capable of detecting alpha/beta particle radiation.

### b. Depot Maintenance.

- (1) Depot-level **Tritium** maintenance areas, or **Tritium** Installation Repair Rooms (TIRR), must be specifically authorized by TACOM-RI License Staff and must meet the following criteria:
  - (a) Air Monitoring. A tritium air monitor is required for each depot level maintenance facility. The alarm must be set no higher than  $5 \times 10^{-6}$  microcuries/ml.
  - (b) Fume Hoods. All actions on devices with broken tritium sources, or that involve the removal of a potted tritium vial, must be performed inside an exhaust hood. The hood must have an average face velocity of 100 linear feet per minute with the shield in the operating position.
  - (c) Storage. Items awaiting repairs must be stored in areas separate from the TIRR. Storage area posting requirements are applicable.
  - (d) Ventilation. Areas where personnel are working with tritium must have adequate ventilation to prevent undue exposure to personnel.
  - (e) Surveys. Monthly area wipe surveys are required of all TIRRs. Each installation containing one or more TIRR must have at least one liquid scintillation counter.
- (2) Depot level maintenance of **Non-Tritium** devices may be performed at locations authorized to do so by TACOM-RI License Staff. The maintenance facility must meet the following criteria:

## RADIATION SAFETY PROGRAM (Continued)

---

- (a) Each depot-level maintenance facility will meet all of the requirements of Depot level Storage, and
- (b) Instrument Surveys must be performed of the work area at the end of each workday when maintenance activities have been performed.

### c. Posting Requirements

Areas where licensed devices are used, maintained, and/or stored must be conspicuously posted with “No eating, drinking, or smoking” signs. The license does not require “CAUTION, RADIOACTIVE MATERIAL” signs be posted. Federal regulations exempt posting of storage areas containing only sealed sources less than 5 mR/hr at 30cm, but they are required by Army regulations. Maintenance and storage areas will also be posted with copies of the following:

- (1) NRC Form 3 (Available on the TACOM-RI web page),
- (2) Section 206 of the Energy Reorganization Act of 1974.
- (3) TACOM-RI license NRC 12-00722-06 and/or 16, and Amendments
- (4) 10 CFR parts 19, 20, and 21
- (5) Emergency Points of Contact Sign
- (6) Any outstanding Notices of Violation (NOV)

In lieu of posting documents (3), (4) and (5), a notice may be posted with the NRC Form 3 and Section 206 that describes the documents and where they and applicable SOPs may be examined.

### d. Monitoring Requirements

Radioactive sources used by the Army are non-exempt sources because of the *activity* level and the potential for individual radiation exposure and Dose. The NRC regulates the possession, use, transfer, storage, and disposal of these sources via TACOM-RI license number 12-00722-06 and 16. As a condition of these licenses, the Army is required to implement and maintain a radiation safety program to minimize personnel exposure and source integrity.

- (1) **Factors that affect the selection and use of radiation monitoring instruments.** Individuals who are selecting instruments for radiation monitoring should know:

## RADIATION SAFETY PROGRAM (Continued)

---

- (a) The purpose for which the instrument will be used. An instrument designed for detection should not be used to measure radiation dose rate or exposure rate.
- (b) The type of radiation to be detected or measured. A specially designed Geiger-Mueller (GM) counter can detect beta and gamma radiation, but a portable alpha counter that is properly calibrated will not measure gamma radiation.
- (c) The energy of the radiation. The instrument selected must be capable of measuring or detecting the radiation in question. Most instruments are designed to respond to a wide energy spectrum. However, a GM counter or an ionization chamber cannot monitor tritium; the weak beta radiation emitted by tritium requires measurement by liquid scintillation or special windowless counters.
- (d) The source chemical/physical form - gas, liquid, or solid - organic or inorganic.
- (e) The environment the instrument is to be used in. Some instruments may respond to heat, cold, light, radio frequency radiation, and shock. When used near operating equipment, particularly vehicles with generators or alternators, survey instruments may respond to induced electrical fields.

### (2) Radiac Instrumentation

Each facility that performs maintenance on the equipment containing licensed radioactive materials shall have available functional and calibrated radiation detection equipment appropriate for the radioactive source involved.

- (a) **Portable Alpha Survey Instruments.** Detection of alpha radiation is difficult due to the short range of the alpha particle in the air. Test data shows that the detector should be placed within one-quarter inch from the source, preferably at 1/8-inch standoff for accuracy. Alpha instruments are:

- (i) **AN/PDR-77.**

The AN/PDR-77 is the fielded radiac instrument used by the Army to detect and measure alpha. The AN/PDR-77 comes with an alpha probe, a beta/gamma probe, and a x-ray probe and is considered a "Smart" instrument in that it will recognize which of its probes is connected and automatically reset the instrument parameters for that probe. The alpha probe has a 100 sq cm Mylar window and generates a readout in Counts per Minute (CPM). Units servicing M43A1 chemical agent detectors

## RADIATION SAFETY PROGRAM (Continued)

---

(M8) must have a minimum of two calibrated units on hand at each maintenance facility.

The AN/PDR-77 check source is a thorium-232 source and it is not labeled as radioactive material. Because alpha particles are easily shielded the check source is exposed on the "ALPHA SIDE", therefore handle the source by holding the edges and wash your hands after handling.

### (ii) AN/PDR-60 Portable Alpha Counter.

A portable survey counter operating on the scintillation principle. The AN/PDR-60 is the standard alpha Radiac meter for the Navy and may be found in Army Reserve and National Guard units. It is a rugged, waterproof instrument with an integral battery check feature. A check source is attached to the base of the main case so that instrument operation may be checked at any time.

- (b) **Portable Beta/Gamma Survey Instruments.** The beta/gamma instrument used in the US Army is the AN/VDR-2 Radiac Set. It is used to detect and measure radioactivity in the form of gamma rays and beta particles. A minimum of two calibrated units must be on hand with each maintenance unit servicing items containing Ni-63. The AN/VDR-2 displays dose rates and total accumulated dose in the operating ranges as follows:

Gamma 0.01  $\mu$ Gy/hr (1 rad/hr). to 100 Gy/hr (10,000 rad/hr).

Beta 0.01  $\mu$ Gy/hr (1 rad/hr). to 5 cGy/hr (10 rad/hr).

Dose 0.01  $\mu$ Gy (1 rad) to 9.99 Gy (999 rad)

The AN/VDR-2 contains a 1 nanocurie thorium-232 check source.

The AN/VDR-2 is similar to the AN/PDR-77 with the beta/gamma probe attached and can be substituted for the AN/PDR-77 only for maintenance shops that do not conduct maintenance on the M8A1/M43A1.

The new non-tactical Health and Safety meter is the AN/PDR-77 Radiac Set has a detachable, beta/gamma (AN/VDR-2) Geiger-Mueller probe, in addition to the detachable alpha probe described above. The readout is in mR/hr.

The beta/gamma probe (with the end window open) may be used for conducting surveys of wipes and work surfaces when maintenance is conducted on equipment containing Nickel-63 (i.e.,

## RADIATION SAFETY PROGRAM (Continued)

---

CAM, ICAM, or M22 ACADA). Due to the low energy beta emission of the Nickel-63, the probe should be held as close to the surface or object being surveyed.

- (c) **Calibration.** All survey meters used under license number NRC 12-00722-06 must be calibrated at intervals not exceeding one year and after repair. Calibration standards used must be traceable to the National Institute of Standards and Technology. Ensure radiac instruments are calibrated to ACTIVE standards, and have an ACTIVE sticker in place, if they are to be used for health safety purposes.

### (3) Surface Contamination Surveys

Surfaces must be monitored for removable contamination. This is especially important with alpha emitters to prevent internal dose. Fixed alpha contamination does not present an exposure problem, however it does prevent the determination of removable contamination with a surface measurement. Surface levels of removable contamination must be determined with a smear or wipe test. It is essential to perform a wipe or smear test to determine the presence of removable contamination and must be performed at the following intervals:

- (a) Any instrument or device containing a tritium, americium or nickel source that is damaged or suspected of being damaged must be wipe tested by the RSO for removable contamination. The action level for devices containing tritium is 10,000 dpm / 100 cm<sup>2</sup>, for instruments containing americium-241, (M43A1), 20 dpm per wipe, and for instruments containing nickel-63, (CAM, ICAM and ACADA), 1000 dpm / 100 cm<sup>2</sup>. Contaminated instrument or devices must be handled in accordance with Section III, Paragraph 3-2 (Tritium), Section IV, Paragraph 4-2 (Americium-241) or Section V, Paragraph 5-2 (Nickel-63).
- (b) **Daily** instrument surveys must be performed in **non-tritium** repair areas on days when repair or maintenance activities have taken place.
- (c) All **TIRRs** are required to be wipe surveyed **monthly**.

Both **tritium** and **non-tritium** DS/GS maintenance areas must have routine area wipe surveys performed quarterly.

All **radiologically controlled** areas and areas adjacent to controlled areas must be wiped **quarterly**.

## RADIATION SAFETY PROGRAM (Continued)

---

**Quarterly** wipe surveys must be performed in all *tritium* and *non-tritium* storage areas.

Removable beta/gamma (tritium and nickel-63) contamination levels must be maintained at 10,000 dpm/100 cm<sup>2</sup> or less on devices containing tritium or in controlled areas and 1,000 dpm/100 cm<sup>2</sup> or less in uncontrolled areas. Removable alpha (americium) contamination levels must be maintained at 220 dpm/100 cm<sup>2</sup> or less in controlled areas and 20 dpm/100 cm<sup>2</sup> or less on instruments containing americium-241 or in uncontrolled areas.

Bulk storage and depot-level maintenance facilities must have at least one liquid scintillation counting system. Liquid scintillation counters used to evaluate wipe test samples must be calibrated quarterly using NIST traceable sources, and may be calibrated in-house.

Equipment and facilities released for unrestricted use must have a maximum removable surface contamination of 20 dpm/100 cm<sup>2</sup> for Americium 241 and 1000 dpm/cm<sup>2</sup> for Nickel 63 and Tritium. The average direct (fixed plus removable) surface reading should be no greater than 100 dpm/cm<sup>2</sup> for Americium 241 and 5000 dpm/cm<sup>2</sup> for Nickel 63 and Tritium.

### e. **Leak Tests**

#### (1) **Requirements**

Devices containing Americium 241 or Nickel 63 must be leak tested annually. Devices containing tritium are exempt from leak test requirements.

Americium 241 and Nickel 63 containing devices in bulk or long-term storage are exempt from leak test. However, if a device is in long-term storage for 10 years it must be leak tested even if it is to remain in storage. Non-tritium devices in long term storage greater than nine months may not be put back into service until they have been leak tested.

Non-tritium devices received from another depot, camp, post, or installation without evidence of leak test within the last 12 months may not be put into service until they have been leak tested.

Leak test analysis must be capable of detecting the presence of 0.005 microcuries of removable contamination. Results in excess of 0.005 microcuries must be reported to the TACOM-RI License Staff immediately. TACOM-RI then reports this to the US Nuclear Regulatory Commission (NRC). TACOM-RI has established a much more stringent action level of 20 dpm for alpha contamination and 1,000 dpm/100 cm<sup>2</sup> for beta contamination. Americium 241 devices that exceed

## **RADIATION SAFETY PROGRAM (Continued)**

---

contamination action levels must be withdrawn from service for shipment to depot maintenance or radioactive waste disposal. Nickel 63 devices that exceed contamination action levels must be retested and removed from service if contamination levels are verified to be greater than 1000 dpm. Contaminated Nickel 63 devices must be evaluated for disposition at the depot maintenance level.

The Rock Island Arsenal, Radiological Test Lab, analyzes leak test samples. Individuals or agencies authorized by the US NRC or Agreement State can also perform sample analysis. If mailing Americium 241 or Nickel 63 leak tests to the Rock Island Arsenal for analysis, label the outer envelope "Mailroom – Do Not Open", and address to:

ROCK ISLAND ARSENAL  
1 Rock Island Arsenal  
AMSTA-RIA-SEM  
ATTN: Mail Room Do Not Open  
RODMAN AVE., BLDG. 210, RM 407  
ROCK ISLAND, IL 61299-5000

Leak test kits for the CAM, ICAM, and ACADA are available through the supply system. The NSN for the leak test kit is 6665-01-447-5639.

### **(2) Leak Test Procedures**

#### M43A1 Chemical Agent Detector (CAD).

- (a) Prepare a work area or table by covering all work surfaces with paper. Assemble leak testing supplies and clean paper envelope.
- (b) Put on disposable gloves and any other PPE listed in the SOP.
- (c) Place CAD on work surface. Unfasten the four catches and remove the bottom case of the M43A1 detector.
- (d) Record the serial numbers of cell module and the M43A1 on the envelope.
- (e) Rotate the turn lock handle of the cell module  $\frac{1}{4}$  turn counterclockwise and pull the cell module from the chassis assembly.
- (f) Insert a dry, disposable applicator through the red seal of the chassis and into the small hole (cell module outlet port connector), twisting the applicator as it is pulled out.

## **RADIATION SAFETY PROGRAM (Continued)**

---

- (g) Screen wipe test with an appropriately calibrated survey meter. If a sustained reading is observed on the meter 1X scale in excess twice background, notify the supervisor and the Installation RSO. Immediately double bag the M43A1 and tag as potentially leaking.
- (h) Place applicator in the labeled envelope. Seal envelope with tape (DO NOT LICK THE ENVELOPE).
- (i) Place labeled, sample envelope into an addressed, stamped envelope and mail to the Rock Island Arsenal or other leak test analysis lab licensed by the NRC or an Agreement State to perform such services.
- (j) Wash hands with non-abrasive soap and cool water.

### Chemical Agent Monitor (CAM) and Improved Chemical Agent Monitor (ICAM).

- (a) Prepare a work area or table by covering all work surfaces with paper. Assemble leak testing supplies and data sheets.
- (b) Put on disposable gloves and any other PPE listed in the SOP.
- (c) Remove the environmental cap at the rear of the device to view the drift tube model serial.
- (d) Place CAM on work surface. Record the serial numbers of the drift tube module and the CAM on the data sheets.
- (e) Replace the environmental cap.
- (f) Use a Whatman filter paper to wipe the front exterior of the CAM and around the nozzle.
- (g) Place filter paper into a numbered sample vial.
- (h) Use a different vial for each wipe.
- (i) Place numbered vials into the briefcase/box for shipping and mail to the Rock Island Arsenal or other leak test analysis lab licensed by the NRC or an Agreement State to perform such services.
- (j) Wash hands with non-abrasive soap and cool water.

#### **f. Inventory Requirements**

It is the responsibility of the installation RSO to ensure that a physical inventory of licensed commodities be performed on an annual basis. Missing items must be reported to TACOM-RI License Staff **immediately**. AR 710-2

## **RADIATION SAFETY PROGRAM (Continued)**

---

Table 2-1, requires unit commanders to perform Hand receipt inventories of controlled items at least quarterly. It further requires that items that are identified by serial number have the serial number verified as part of the inventory.

### **8-4. INSPECTIONS**

The NRC is mandated to perform unannounced inspections of radioactive materials licensees. If NRC inspectors arrive at any location that is authorized use of licensed commodities, they must receive the complete cooperation of local personnel.

TACOM-RI License Staff or their designees and representatives conduct a regular program of license compliance inspections at, camps, posts, stations and depots where commodities are used, stored or maintained. Depots covered under Defense Logistics Agency licenses are not included in TACOM-RI inspections.

Various Army MACOMs and MSCs have begun a cooperative effort to minimize the number of inspections at each camp, post, station or depot. Army Materiel Command license holders will combine efforts and conduct only one joint license inspection, per inspection cycle, of each activity owning licensed commodities. Inspections will cover all activities and commodities authorized under the various NRC licenses. These inspections are intended to ensure compliance with all Army radioactive materials licenses and validate the local radiation protection program.

### **8-5. RADIOACTIVE WASTE**

Radioactive Waste is handled by the Department of Defense Executive Agency for Low Level Radioactive Waste, which is part of the Operations Support Command (OSC) at Rock Island Arsenal, Rock Island IL.

For Radioactive Waste disposition, contact the Item Manager for the commodity being disposed (found on the TACOM-RI web page) and the OSC Radioactive Waste Team at (309) 782-0338 or DSN 793-0338. Radioactive Waste should be kept in a designated storage area. Do not send radioactive waste to DRMO.



## SECTION IX. RADIOACTIVE MATERIALS TRANSPORT GUIDELINES

SECTION INDEX		
	Para	Page
Introduction.....	9-1	9-1
Regulatory Authority.....	9-2	9-1
Definitions .....	9-3	9-2
Overview of Excepted Packages Regulations .....	9-4	9-2
Survey Procedures Prior to Shipment .....	9-5	9-4
Receiving and Opening Packages.....	9-6	9-5
Incident Notification.....	9-7	9-6
Status of Forces Agreements (SOFA).....	9-8	9-7
Security Issues .....	9-9	9-7

**9-1. INTRODUCTION.** This guideline is written to assist the users of TACOM-RI equipment in understanding the transportation requirements of the Code of Federal Regulations (CFR). Specifically, it covers TACOM-RI radioactive commodities that are classified as "excepted package-instrument or articles."

**9-2. REGULATORY AUTHORITY.** Transportation of radioactive materials is governed by conditions identified within the NRC license and requirements specified in 10 CFR Part 71. Throughout this summary, frequent references are made to the CFR sections for your convenience.

If you are a Radiation Safety Officer (RSO) or Hazmat employee, (see definition in para. 9-3 this chapter) you will need to become familiar with these regulations. Your safety office should be able to provide you with copies. For the purposes of this TB, personnel working in shipping and receiving, and the various RSOs are considered Hazmat Employees. Therefore, these people must meet the training requirements found in 49 CFR 172, Subpart H.

The regulations covered in this section are summarized in Figure 9-2 and include:

Title 10 CFR Part 20.

Title 10 CFR Part 71 (refers to 49 CFR). IAW 10 CFR Part 71.5a: "Each licensee who transports licensed material outside the site of usage, as specified in the NRC license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, shall comply with the applicable requirements of the DOT regulations in 49 CFR parts 170 through 189 appropriate to the mode of transport."

Title 49 CFR Parts 171-177 (predominately Part 173).

## RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)

---

The US Army Communications and Electronics Command (CECOM) has published guidelines for the transportation of U.S. Army Radioactive Commodities in the form of Technical Bulletin 43-0137. This technical bulletin is available at the following web site: <https://www.logsa.army.mil/etms/data/A/072563.pdf>

Note: If there is a conflict between this TB and the CFRs, the CFRs are the controlling authority.

### 9-3. DEFINITIONS (49 CFR 173.403).

*Hazmat Employee.* Briefly stated, a HAZMAT employee is anyone who directly affects hazardous materials transportation safety.

*Class 7 (radioactive) material.* (See the definition of radioactive material below).

*Excepted package* means a package together with its excepted Class 7 (radioactive) materials.

*Instruments and articles* means any manufactured instrument and article such as an instrument, clock, electronic tube or apparatus, or similar instrument and article having Class 7 (radioactive) material as a component part. An excepted package of instruments and articles must conform to the requirements of 49 CFR 173.424.

*Limited quantity of Class 7 (radioactive) material* means a quantity of Class 7 (radioactive) material not exceeding the materials package limits specified in 49 CFR 173.425 and conforming with requirements specified in 49 CFR 173.421.

*Non-fixed radioactive contamination* means radioactive contamination that can be readily removed from a surface by wiping with an absorbent material.

*Package* means, for Class 7 (radioactive) materials, the packaging together with its radioactive contents as presented for transport.

*Radioactive material* means any material having a specific activity greater than 70 Bq per gram (0.002 microcurie per gram).

**9-4. REGULATORY EXEMPTIONS.** These regulations DO NOT apply for movement of radioactive commodities during armed conflict, mobilization, military deployment, or declared emergencies. Certain other situations are exempted as follows:

- a. Requirements in 49 CFR 173.7(b), Movement of Government Material, provide an exemption for shipments made for the purpose of national security. National security is a rather broad term that covers many things the Army does. For example, transportation for training purposes (e.g., army convoys) is considered for the purpose of national security. However, there are two important qualifiers under this exemption:
  - (1) The movement must be escorted by personnel specifically designated by or under the authority of the owning agency. For transportation by a

## RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)

---

motor vehicle or a rail car, the escorts must be in a separate vehicle/rail car from the transport vehicle carrying the hazardous materials excepted by this paragraph.

- (2) A document certifying that the shipment is for the purpose of national security must be in the possession of the person in charge of security during the transportation.
- b. Movement of hazardous material on public highways within DoD installations, by DoD personnel, is not considered "in commerce" and therefore is exempt from DOT regulations. If, however, the movement leaves the DoD installation for any part of the shipment, it is then "in commerce" and DOT regulations must be applied.
- c. Another exemption is provided by the definition of a shipment itself (see paragraph 9-5). If you do not consign the radioactive material to a third party and transport the material in a government vehicle it is not considered to be a shipment. For example, a soldier or civilian employee who transports an item in a government vehicle and maintains constant surveillance of the item per 10 CFR 20.1802 is not conducting a shipment.

**9-5. DEFINITION OF A SHIPMENT.** Radioactive commodities offered for transport are considered "in shipment" and subject to the appropriate Nuclear Regulatory Commission (NRC) and DOT regulations when:

- a. The packaged items or equipment leave the possession and control of the shipper, and
- b. The package is consigned (given) to a third party, i.e., private, contract, commercial or military carrier, and
- c. The packaged material leaves military installation and is transported on public roads, rail, ship or air, and
- d. None of the above exemptions in paragraph 9-4 apply.

**9-6. OVERVIEW OF EXCEPTED PACKAGES REGULATIONS.** In Department of Transportation (DOT) terminology, an "excepted package" is "excepted" (exempt) from the many requirements of 49 CFR. Hence the term "excepted package." This greatly simplifies the procedures for shipping TACOM-RI licensed commodities. If you consult the 49 CFR table of contents, you'll see the number of regulations eliminated by being "excepted". However, there are still requirements to be met. Excepted packages of Instruments and Articles are subject to 49 CFR 173.424 as summarized in the following:

- a. **General Design Requirements 49 CFR (173.424(a)).** Each package must meet the general design requirements of 49 CFR 173.410 (i.e. easily handled and properly secured, exterior surface easily decontaminated etc.).

**RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)**

- b. **Quantity Limits 49 CFR (173.424(b), (c)).** The quantity of radioactive material in *each instrument or article*, and the total quantity packaged in the *excepted package* must not exceed the relevant limit listed under "Instruments and Articles in Table 9-1 below."

Table 9-1  
Activity Limits for Instruments, and Articles  
(from Table 7 of 49 CFR 173.425)

Nature of Contents	"Instruments & Articles"		"Limited Quantity"
	Limits of Each Instrument or Article TBq (Curie)	Package Limits TBq (Curie)	Package Limits TBq (Curie)
Solids: Special form AM-241...	0.02 (0.541)	2 (54.1)	0.002 (0.0541)
Normal form NI-63 ... TH-232...	0.3 (8.11) infinity	30 (811) infinity	0.03 (0.811) infinity
Gases: Tritium H-3 ...	0.8 (21.6)	8 (216)	0.8 (21.6)

Tbq: Terabecquerel or  $1 \times 10^{12}$  Becquerel

- c. **Radiation Levels.**
- (1) Instrument or Articles 49 CFR (173.424(d)). TACOM-RI commodities are well below the radiation levels of 0.1 mSv/hour (10 mrem/hour) at 10 cm (4 inches). This requirement for the exterior surface of the instrument has been met.
  - (2) Package Surfaces 49 CFR (173.424(e)). Intact TACOM-RI commodities are typically below the radiation levels of the 0.005 mSv/hour (0.5 mrem/hour). However, surveys of the M8A1/M43A1 must be performed to verify readings are within these limits.
- d. **Surface Contamination Limits 49 CFR (173.424(f)).** The level of non-fixed (removable) radioactive contamination on the external surfaces of each package offered for transport must be kept as low as reasonably achievable (ALARA-10 CFR 20.1101(b)). Per CFR, the level of removable radioactive contamination may not exceed the limits set forth in Table 9-2 below.

## RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)

Table 9-2  
Non-Fixed External Radioactive Contamination - Wipe Limits  
(from Table 11 of 49 CFR 173.443)

Contaminant	Maximum permissible limits		
	Bq/cm <sup>2</sup>	Micro-Curie/cm <sup>2</sup>	DPM/cm <sup>2</sup>
Beta, gamma and low toxicity alpha emitters (H-3, Ni-63, TH-232)	0.4	1x10 <sup>-5</sup>	22
All other alpha emitting radionuclides (Am-241)	0.04	1x10 <sup>-6</sup>	2.2

NOTE 1. Wipes are to be taken of a 300 cm<sup>2</sup> area vs the standard 100 cm<sup>2</sup> area.

NOTE 2. The License Leak Test limits are more restrictive at 20 DPM/100 cm<sup>2</sup> for Alpha and 1000 DPM/100 cm<sup>2</sup> for Beta/Gamma

- e. **Certification Statement 49 CFR (173.424(h)).** An excepted package of instrument and articles must be certified as being acceptable for transportation by having a notice enclosed in or on the package, included with the packing list, or otherwise forwarded with the package\*. This notice must include the name of the consignor or consignee and the following statement:

**"This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package-instruments or articles, UN2910."**

\*It is best to fasten the notice on the outside of the package so it is visible to the carrier and receiver.

- f. **Regulation Checklist.** Figure 9-2 at the end of this section provides the regulations referenced above in a checklist format. Users are encouraged to refer to the checklist as needed to assure regulatory compliance.

### 9-7. SURVEY PROCEDURES PRIOR TO SHIPMENT.

- a. 49 CFR 173.443(a) specifies that a wipe test may not exceed the limits of Table 9-2 at any time during transport and must be determined by either: (1) Taking a 300 cm<sup>2</sup> wipe survey of the external surface of the outer packaging to verify contamination is less than table 9-2 limits (see 173.443(a) (1)); or (2) Using other methods of assessment of equal or greater efficiency (see 49 CFR 173.443(a)(2)).
- b. Alternatively, if wipe test of the items presented for shipment verify that the items are not contaminated, new packaging material may be used in place of packaging surveys. The test results must be received and reviewed prior to

## RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)

---

packaging the item(s).and a copy of all wipe tests must be placed either in the package or accompany the shipping papers.

- c. Preparation of chemical agent devices should include: (1) a visual inspection of the devices for damaged that may compromise the source(s) and (2) assurance that the annual leak tests are current.
- d. Preparation of tritium devices should include: (1) a visual inspection and illumination test of each article or device prior to packaging. and (2) wipe tests of damaged devices or items suspected of being compromised verifying contamination is less than the Table 9-2.limits.

**9-8. RECEIVING AND OPENING PACKAGES.** The following monitoring procedures for receiving and opening packages are from Title 10 CFR 20.1906 paragraphs (b)(3), (c) and (e).

- a. Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged.
- b. Perform this monitoring as soon as practical after receipt of the package, but not later than three (3) hours after the package is received if it is received during normal working hours. If it is received after working hours, monitor package not later than three hours from the beginning of the next working day.
- c. Every RSO shall establish, maintain, and retain written procedures for safely opening packages in which radioactive material is received; and ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.

**9-9. INCIDENT NOTIFICATION.** For any required regulatory notification involving a TACOM-RI commodity, contact the TACOM-RI License Staff **immediately** following the incident. The incident notification requirements are summarized below.

- a. The requirements of 10 CFR 20.1906(d) demand an **immediate** notification of the final delivery carrier and the NRC when removable contamination exceeds the limits of 49 CFR 173.443 (table 9-2 above).

Note that normally the licensee notifies the NRC. It is not recommended that you notify the NRC directly.

- b. The requirements of 49 CFR 171.15 (reference 173.422(b)) demand that the Department of Transportation (DOT) be notified as early as possible if an incident in which fire, breakage, spillage, or suspected radioactive contamination occurs during the course of transportation (including loading, unloading or temporary storage). The notice shall be given to the DOT by calling (800) 424-8802. Shipments involving aircraft will be given to the Centers for Disease Control at (800) 232-0124. Each notice must include

## RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)

---

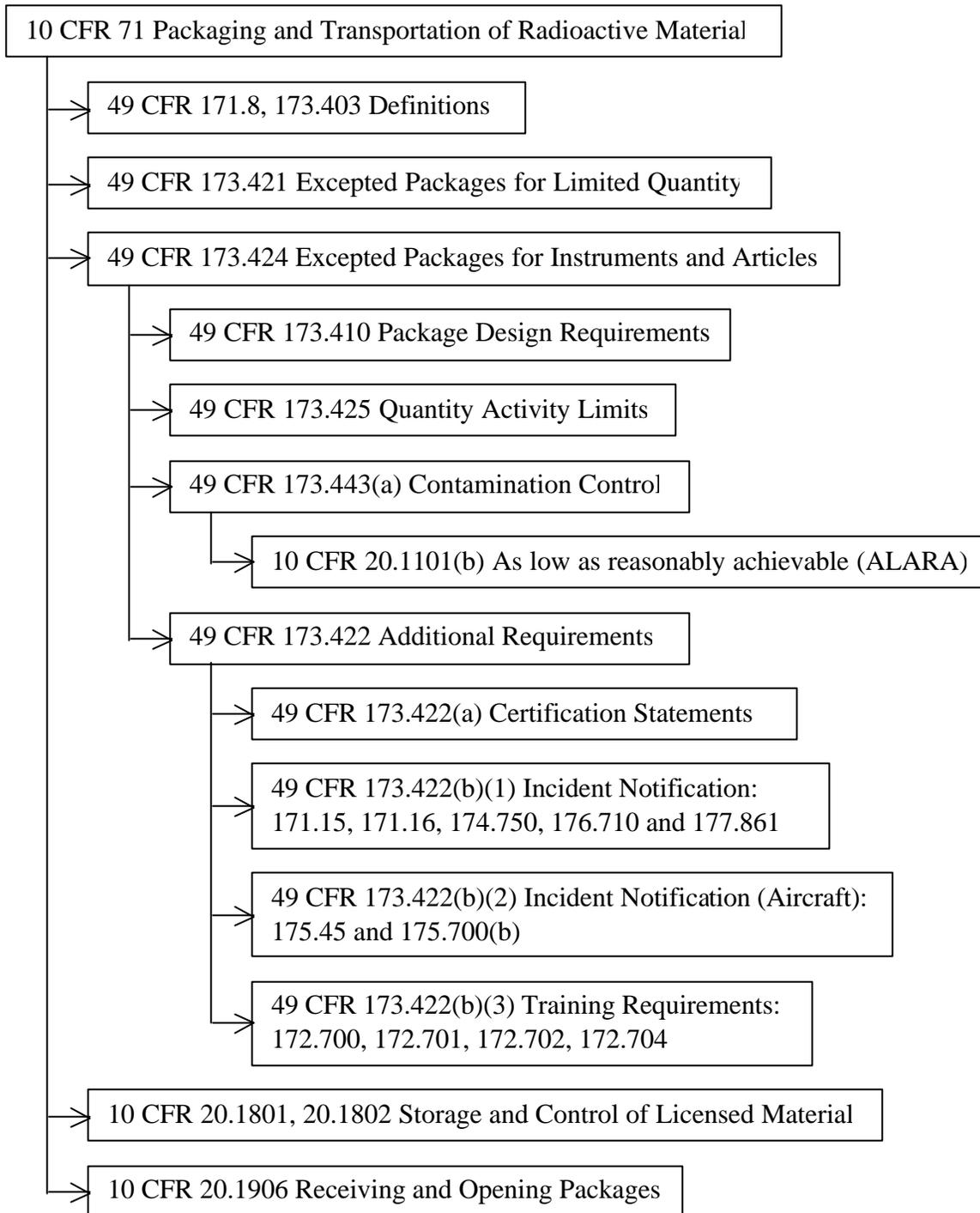
- (1) Name of reporter.
  - (2) Name and address of carrier represented by reporter.
  - (3) Phone number where reporter can be contacted.
  - (4) Date, time, and location of incident.
  - (5) The extent of injuries, if any.
  - (6) Classification, name, and quantity of hazardous materials involved, if such information is available.
  - (7) Type of incident and nature of hazardous material involvement and whether a continuing danger to life exists at the scene.
- c. Written Report. Each carrier making a report under this 49 CFR 171.15 shall also make a written report within 30 days of the incident as required by 49 CFR 171.16.
- d. Additional requirements. Sections 174.750, 175.45, 175.700 (b), 176.710, and 177.861 of 49 CFR impose additional requirements on the carrier, the consignee, and indirectly, the license holder. If a situation should arise which demands notification pursuant to these regulations, consult the referenced section of the CFR for the specific requirement(s).
- (1) Rail, Aircraft, Highway (49 CFR 174.750 (a), 175.700 (b), and 177.861 (a)). The carrier shall also notify the shipper at the earliest practicable moment if an incident in which fire, breakage, spillage, or suspected radioactive contamination occurs during the course of transportation (including loading, unloading or temporary storage).
  - (2) Aircraft, (49 CFR 175.45(a)(2)). Each operator who transports hazardous materials shall report to the nearest FAA Civil Aviation Security Office by telephone at the earliest practicable moment following any incident in which fire, breakage, spillage, or suspected radioactive contamination occurs during the course of transportation (including loading, unloading or temporary storage).

**9-10. STATUS OF FORCES AGREEMENTS (SOFA).** Shipment within foreign countries or between the US and foreign countries will require compliance with other regulations (IATA, ADR, etc.). The regulatory requirements governing the control and movement of radioactive commodities DO NOT apply outside the borders of the United States. If a host country has not adopted the DOD or DA doctrine, the management of radioactive commodities shall be in accordance with an approved Status of Forces Agreement (SOFA). The MACOM RSO or RCO should be consulted for assistance in meeting local (foreign) requirements for handling and transporting TACOM-RI licensed radioactive commodities.

**9-11. SECURITY ISSUES.** Whether the transportation is considered a shipment or not, security of the licensed radioactive material during the course of transportation (including loading, unloading or temporary storage) is required by 10 CFR Part 20, Subpart I.

For radioactive equipment carried on the side of artillery and tanks, special care is required. Fire control devices on artillery must be removed and placed in the Basic Issue Item (BII) box and locked. The Muzzle Reference Sensor (MRS) on the M1 series tank tubes must be removed and locked inside the turret.

Figure 9-1 to Chapter IX  
Referenced Regulations for Excepted Packages



## RADIOACTIVE MATERIALS TRANSPORT GUIDELINES (Continued)

---

### Figure 9-2 to Chapter IX Checklist

The following checklist procedure for complying with the transportation requirements. Users are encouraged to refer to them as needed to assure regulatory compliance.

Yes /No	REG	DESCRIPTION
	49 CFR 173.424(b)	Does the activity (quantity of radioactive material) of the instrument or article meet the relevant limit listed in table 7 in Sec. 173.425?
	49 CFR 173.424(c)	Does the total activity per package meet the relevant limit listed in table 7 of Section 173.425?
	49 CFR 173.424(f)	Does the nonfixed (removable) radioactive surface contamination on the external surface of the package meet the limits specified in Section 173.443(a)?
	49 CFR 173.443(a)	Were wipe tests taken on the external surface of the package and did you place a copy in the package or with the paperwork?
	49 CFR 173.424(h) 173.422(a)	Is each package certified as being acceptable for transportation? Is a notice fasten on the outside of the package so it is visible to the carrier and receiver? Does the notice include the name of the consignor or consignee and the following statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package-instruments or articles, UN2910".
	10 CFR 20.1801, 20.1802	Are the packages secure from unauthorized removal?

NOTE: If any of the above responses are negative, the item or package is NOT ready for shipment!

## APPENDIX A - INCIDENT REPORTING

The Nuclear Regulatory Commission licenses the use of radioactive materials in various items of supply, such as fire control for artillery, chemical agent monitor, and chemical agent detector. The NRC requires the licensee, the Command that holds and manages the NRC license, to report the LOSS, THEFT or RELEASE (i.e. BREAKAGE or FIRE) of licensed material.

Reporting requirements are related to the amount of radioactive material in the object lost, stolen or released. Values that require reports are related to the health hazard associated with each type of radioactive material. For some TACOM-RI commodities, reporting is required for the loss or breakage of a single item.

The following chart lists quantities of lost, stolen or released (through fire or breakage) TACOM-RI radioactive material that would require reporting.

ISOTOPE	Lost or Stolen	Breakage or Fire
Tritium (H-3)	1.0 Ci	0.4 Ci
Americium 241	0.000001 Ci	0.00000003 Ci
Nickel 63	0.1 Ci	0.004 Ci
Promethium 147	0.01 Ci	0.0005 Ci

If a report is indicated based on this chart, do the following:

**FIRST:** Call your local Radiation Safety Officer (RSO). Reports should be made up the chain-of-command.

**SECOND:** Complete the Organization/Maintenance Incident Reporting Worksheet that follows. The RSO should then complete the RSO Incident Reporting Worksheet, also in this section.

**THIRD:** Call the TACOM-RI License Staff. **The RSO or safety office should make this notification.**

**Do not** contact the NRC Operation Center directly, unless there is an emergency and the TACOM-RI License Staff cannot be contacted.

Prepare and submit a written report to the TACOM-RI License Staff:

## INCIDENT REPORTING – (Continued)

---

Department of the Army  
AMSTA-CS-CZR  
U.S. Army Tank-Automotive and Armaments Command  
1 Rock Island Arsenal  
Rock Island, IL 61299-7630

Data fax number: Commercial (309) 782-6758, DSN 793-6758.

The POCs are:

	<u>TITLE</u>	<u>DSN</u>	<u>Commercial</u>
Tom Gizicki	Primary RSO	793-2965	(309) 782-2965
Tim Mohs	Alternate RSO	793-6228	(309) 782-6228

## INCIDENT REPORTING

---

### Organization/Maintenance Incident Reporting Worksheet

Name and Phone Number of Person Submitting Report (Optional):	Address of Person Submitting Report:
RSO Name and Phone Number:	LRSO Name and Phone Number:
Item Involved (Nomenclature, NSN, Part Number):	
Circumstances Date and Time:	
List of People Involved:	
RSO Notification Date/Time:	
Additional Comments:	

## INCIDENT REPORTING – (Continued)

---

### RSO INCIDENT REPORT CHECKLIST

#### A. THE EVENT

- 1. Name and Phone # of Person Reporting
- 2. Date event occurred
- 3. Item involved
- 4. Isotope and quantity involved
- 5. Where event occurred
- 6. Number of personnel involved

#### B. NOTIFICATIONS

- 1. Garrison Commander
- 2. TACOM LAR
- 3. MACOM RSO (FORSCOM/TRADOC/etc.)

#### C. ACTIONS TAKEN

- 1. Is item controlled? (i.e., bagged/placed in hood, etc.)
- 2. Have wipes of item been taken?
- 3. Has area been wiped? (including adjacent areas)
- 4. Has ventilation been wiped?
- 5. Is the area isolated? (if necessary)
- 6. What is the decon status?
- 7. Have bioassays been performed? (if NEEDED)  
(only after 4 hours have elapsed)

#### D. INFORMATION ABOUT ITEM(S)

- 1. History of item (where it came from)
- 2. Condition of item upon receipt
- 3. What was done to the item after receipt?
- 4. Where was item stored?
- 5. Where was item worked?
- 6. What precautions were taken?
- 7. Was/is item illuminated?
- 8. How many people handled the item?
- 9. What caused the problem?
- 10. What corrective actions are planned?

#### E. PERSONNEL STATUS

- 1. Were personnel involved properly trained?
- 2. Were all personnel involved interviewed?
- 3. Were ALL persons involved BIOASSAYED?

#### F. SUBMIT WRITTEN REPORT TO TACOM-RI License Staff by 15<sup>th</sup> DAY

## APPENDIX B - GLOSSARY

**DEFINITIONS.** For the purpose of this document, the following definitions apply:

**ARSO**: Alternate Radiation Safety Officer

**Absorbed dose**: the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

**Activity**: the rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq).

**Adult**: an individual 18 or more years of age.

**Agreement State**: Any State with which the Atomic Energy Commission or the NRC has entered into an effective agreement in which the State assumes many of the NRC's functions.

**Airborne Radioactive Material**: radioactive material dispersed in the air in the form of dust, fume, particulate, mist, vapor, or gas.

**Airborne Radioactivity Area**: a room, enclosure or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:

(1) In excess of the derived air concentrations (DACs) specified in appendix B, to §§20.1001 - 20.2401, or

(2) To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

**ALARA (acronym for "as low as is reasonably achievable")**: to make every reasonable effort to maintain exposures to radiation as far below dose limits as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

**Annual limit on intake (ALI)**: the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue.

**AMC**: Army Materiel Command

**Army regulation**: A directive that sets forth missions, responsibilities, and policies, and establishes procedures to ensure uniform compliance with those policies.

## GLOSSARY – (Continued)

---

**Background radiation:** radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. "Background radiation" does not include radiation from source, byproduct, or special nuclear materials regulated by the Commission or from NARM that the Army regulates.

**Becquerel (Bq):** The SI unit of radioactivity equivalent to one nuclear transformation per second.

**Bioassay (radiobioassay):** the determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (in vivo counting) or by analysis and evaluation of materials excreted or removed from the human body (*in vitro* counting).

**Bulk Storage:** Depot storage facility containing up to 10,000 Curies.

**Byproduct Material:**

(1) Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or utilizing special nuclear material; and

(2) The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "byproduct material" within this definition.

**CHPPM:** US Army Center for Health Promotion and Preventative Medicine.

**Committed Dose Equivalent (H<sub>T,50</sub>):** the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

**Committed Effective Dose Equivalent (H<sub>E,50</sub>):** the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues  $(H_{E,50} = \sum W_T H_{T,50})$ .

**Commodity:** See Radioactive commodity

**Condition:** the status of personnel and equipment (readiness) as they interact with the operational environment during mission planning and execution.

**Control:** action taken to eliminate hazards or reduce their risk.

## GLOSSARY

---

**Controlled Area:** an area, outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason.

**Curie (Ci):** a unit of radioactivity equal to 37 billion becquerels.

**Decommission:** means to remove a facility or site safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the NRC license, Army reactor permit, or Army radiation authorization.

**Deep-Dose Equivalent ( $H_d$ ):** applies to external whole-body exposure, is the dose equivalent at a tissue depth of 1 cm (1000 mg/cm<sup>2</sup>).

**Depot-level Maintenance:** Work authorized at the Depot level only. This work can not be performed at any maintenance facility below the Depot level.

**Depot-level Storage:** Bulk storage of commodities containing radioactive sources. The quantity is limited to 10,000 Curies in any one area without a 10 foot separation or a fire wall between adjoining areas.

**Derived Air Concentration (DAC):** the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an intake of one ALI.

**Derived Air Concentration-Hour (DAC-hour):** the product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. A licensee may take 2,000 DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 5 rems (0.05 Sv).

**Deviation:** A departure from the requirements of an Army regulation.

**Disintegrations Per Minute (DPM):** DPM is a measure of radioactive decay. A curie of a radioactive substance is equal to  $2.22 \times 10^{12}$  dpm.

**Dose or Radiation Dose:** a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined in other paragraphs of this appendix.

**Exposure:** to be exposed to ionizing radiation or to radioactive material. In risk management, the frequency and length of time subjected to a hazard.

**External Dose:** the portion of the dose equivalent received from radiation sources outside the body.

**Giga- (G):** An SI unit prefix indicating a factor of one billion ( $10^9$ ).

## GLOSSARY – (Continued)

---

**Gray:** The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rads).

**Hazmat Employee:** Anyone who directly affects hazardous materials transportation safety.

**Hazard:** Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

**Individual Monitoring:**

(1) The assessment of committed effective dose equivalent by bioassay (see Bioassay) or by determination of the time-weighted air concentrations to which an individual has been exposed, i.e., DAC-hours; or

(2) The assessment of dose equivalent by the use of survey data.

**Installation:** A grouping of facilities located in the same vicinity, which support particular functions. Installations may be elements of a base. Land and improvements permanently affixed thereto which are under the control of the Department of the Army and used by Army organizations. Where installations are located contiguously, the combined property is designated as one installation and the separate functions are designated as activities of that installation. In addition to those used primarily by troops, the term “installation” applies to real properties such as camps, posts, stations, depots, arsenals, ammunition plants (both contractor and Government operated), hospitals, terminals, and other special mission installations. For the purposes of this regulation, United States Army Regional Support Commands are installations.

**Installation Radiation Safety Officer (IRSO):** the person in active Army or Marines that the installation commander designates, in writing, as the executive agent for the installation’s radiation safety program. The IRSO, must successfully complete the 40-hour Radioactive Material Handling Course, or equivalent, as authorized by the licensee.

**Internal Dose:** that portion of the dose equivalent received from radioactive material taken into the body.

**Ionizing Radiation:** charged subatomic particles and ionized atoms with kinetic energies greater than 12.4 eV, electromagnetic radiation with photon energies greater than 12.4 eV, and all free neutrons and other uncharged subatomic particles (except neutrinos and antineutrinos).

**Kilo- (k):** An SI unit prefix indicating a factor of 1000.

**License:** a license issued under the regulations in parts 30 through 36, 39, 40, 50, 60, 61, 70, or 72 of this chapter.

## GLOSSARY

---

**Licensed Material:** means source material, special nuclear material, or byproduct material received, possessed, used, transferred or disposed of under a general or specific license issued by the Commission.

**Licensee:** the holder of a license.

**Limits (Dose Limits):** the permissible upper bounds of radiation doses.

**Long-term Storage Area:** An area designated to secure items removed from service for periods greater than six months.

**Lost or Missing Licensed Material:** licensed material whose location is unknown. It includes material that has been shipped but has not reached its destination and whose location cannot be readily traced in the transportation system.

**Low-level Radioactive Waste:** See Radioactive waste, low-level

**Member of the Public:** any individual except when that individual is receiving an occupational dose.

**Micro- (?):** An SI unit prefix indicating a factor of one one-millionth ( $10^{-6}$ ).

**Milli- (m):** An SI unit prefix indicating a factor of one one-thousandth (0.001).

**Monitoring (Radiation Monitoring, Radiation Protection Monitoring):** means the measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.

**NRC:** the Nuclear Regulatory Commission or its duly authorized representatives.

**Occupational Dose:** the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 10 CFR 35.75, from voluntary participation in medical research programs, or as a member of the public.

**Peta- (P):** An SI unit prefix indicating a factor of one million billion ( $10^{15}$ ).

**PPE:** Personal Protective Equipment issued to individuals to reduce occupational exposures such as gloves, shoe covers, etc.

**Public Dose:** the dose received by a member of the public from exposure to radiation or radioactive material released by a licensee, or to any other source of radiation under the control of a licensee. Public dose does not include occupational dose or doses

## **GLOSSARY – (Continued)**

---

received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with 10 CFR 35.75, or from voluntary participation in medical research programs.

**Quarter:** a period of time equal to one-fourth of the year observed by the licensee (approximately 13 consecutive weeks), providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

**Rad:** A unit of absorbed dose. One rad is equal to an absorbed dose of 0.01 joule/kilogram (0.01 gray).

**RADIAC:** Radio And Digital Instruments And Counters

**Radiation (Ionizing Radiation):** means alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as used in this bulletin, does not include non-ionizing radiation, such as radio- or microwaves, or visible, infrared, or ultraviolet light.

**Radiation Safety:** for the purposes of this regulation, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Same as “health physics” and “radiation protection.”

**Radiation Safety Committee (RSC):** an advisory committee for the commander to assess the adequacy of the command’s radiation safety program.

**Radiation Safety Officer (RSO):** The person that the commander designates, in writing, as the executive agent for the command’s radiation safety program. Same as “radiation protection officer” or “health physics officer.”

**Radiation Safety Program:** A program to implement the objective of radiation safety.

1. The Army’s radiation safety program includes all aspects of:
  - a. Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.
  - b. Army compliance with Federal and DOD radiation safety regulations.
  - c. The Army’s radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and radiation instrument TMDE and calibration programs.
  
2. A command’s radiation safety program includes all aspects of:

## GLOSSARY

---

- a. Measurement and evaluation of radiation and radioactive material within the command as they pertain to protection of personnel and the environment.
- b. Compliance with Federal, DOD, and Army radiation safety regulations.

**Radioactive Commodity:** an item of Government property made up in whole or in part of radioactive material. A national stock number (NSN) or part number is assigned to commodities containing radioactive material greater than 0.01 Ci.

**Radioactive Waste:** Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act, as amended, or is of sufficient quantity to require an Army radiation authorization, and is of negligible economic value considering the cost of recovery.

**Radioactive Waste, Low-level:** Material the NRC classifies as low-level radioactive waste (see 10 CFR 62.2); waste not classified as high-level radioactive waste (spent nuclear fuel), as transuranic waste, or as uranium or thorium tailings and waste; material acceptable for burial in a land disposal facility (10 CFR 61).

**Recorder, RSC:** The person directly responsible for the accuracy and completeness of the RSC minutes. The recorder may designate someone else to take notes at RSC meetings (for example, an assistant or secretary). The recorder should be the RSO to help assure that the minutes meet regulatory requirements.

**Rem:** Roentgen Equivalent Man - a unit of measure for radiation dose, from any type of radiation (Alpha, Beta, Gamma or other) deposited in body tissue, expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by a quality factor that equates the type and energy level of the radiation source to tissue damage. (1 rem = 0.01 sievert).

**Residual Radioactivity:** radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee's control. This includes radioactivity from all licensed and unlicensed sources used by the licensee, but excludes background radiation. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of 10 CFR part 20.

**Respiratory Protective Device:** an apparatus, such as a respirator, used to reduce the individual's intake of airborne radioactive materials.

**Risk:** the chance of hazard or bad consequences; exposure of chance of injury or loss. Risk level is expressed in terms of hazard probability and severity.

**Risk Assessment:** the identification and assessment of hazards (first two steps of the risk management process).

## GLOSSARY – (Continued)

---

**Risk Decision:** the decision to accept or not accept the risk(s) associated with an action; made by the commander, leader, or individual responsible for performing that action.

**Risk Management:** a logical five step thought process, applicable to any situation or environment, for identifying and controlling hazards to protect the force.

**Severity:** the expected consequence of an event in terms of degree of injury, property damage, or other mission impairing factors (loss of combat power, adverse publicity, and so on), that should occur.

**Short-term Storage:** An area designated to secure items, either currently in-use or removed from service, for periods less than six months.

**Sievert (Sv):** The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rem).

**Storage:** items removed from service and deposited in a designated holding area for greater than six months.

**Survey:** an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation

**TACOM-RI:** Tank-Automotive, Armaments Command – Rock Island

**Tera- (T):** an SI unit prefix indicating a factor of one trillion ( $10^{12}$ ).

**Total Effective Dose Equivalent (TEDE):** means the sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

**TRSO:** Tenant Radiation Safety Officer

**Type Classification:** a designation the Army uses to indicate acceptability for service use (AR 70-61).

**Unit RSO (URSO):** An individual, that the commander designates, in writing, as the executive agent for the command's radiation safety program.

**Wipe Test:** a smear or wipe of a surface to determine the presence, type, and amount of radioactive contamination. Wipe Tests are counted with a liquid scintillation counter.

**Whole Body:** for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee.

APPENDIX C – RADIATION LABELS, SIGNS, POSTINGS

TYPICAL RADIOACTIVE MATERIAL DATA PLATES.

	<b>CAUTION</b>	
RADIOACTIVE MATERIAL CONTROLLED DISPOSAL REQUIRED		
AEC LICENCE NO <input type="text"/>		
RADIOISOTOPE H3		
ACTIVITY <input type="text"/>	<input type="text"/>	<input type="text"/>
MILLICURIES		CURIES
LOT NO <input type="text"/>	DATE <input type="text"/>	<input type="text"/>
IF FOUND RETURN TO NEAREST MILITARY ACTIVITY		

	<b>CAUTION</b>	
THIS CASE MAY CONTAIN INSTRUMENT(S) USING RADIOACTIVE MATERIAL ISOTOPE H3 MAX CURIES		

IF FOUND RETURN TO A MILITARY BASE DISPOSAL PER AR 385-11
---

<b>RADIOACTIVE MATERIAL</b>		
	<b>CAUTION</b>	
<b>COUNTERS ISOTOPES H3</b>		
CURIES <input type="text"/>	DATE <input type="text"/>	<input type="text"/>

**RADIATION SAFETY RULES**

1. No Smoking, eating, drinking, applying cosmetics, or chewing gum or tobacco within a radiologically controlled area.
2. Always wash your hands with non-abrasive soap performing any maintenance and/or repair operations.

**NRC FORM 3**

Form 3, "Notice to Employees" can be downloaded from:

<http://www.nrc.gov/NRC/FORMS/form3.html>

**IN THE EVENT OF AN ACCIDENT OR INJURY**

1. Notify your Radiation Safety Officer immediately
2. Injured personnel should be removed under the supervision of medical personnel.

**RADIATION SAFETY OFFICER:** \_\_\_\_\_

**TELEPHONE:** \_\_\_\_\_

**FIRE DEPARTMENT TELEPHONE:** \_\_\_\_\_

**POLICE DEPARTMENT TELEPHONE:** \_\_\_\_\_

**EMERGENCY MEDICAL TELEPHONE:** \_\_\_\_\_

**RADIATION LABELS, SIGNS, POSTINGS (continued)**

PUBLIC LAW 93-438  
93rd CONGRESS, H. R. 11510  
OCTOBER 11, 1974

*AN ACT*

To reorganize and consolidate certain functions of the Federal Government in a new Energy Research and Development Administration and in a new Nuclear Regulatory Commission in order to promote more efficient management of such functions.

SHORT TITLE

Section 1. This Act may be cited as the "Energy Reorganization Act of 1974".

NONCOMPLIANCE

Sec. 206. (a) Any individual director, or responsible officer of a firm constructing, owning, operating, or supplying the components of any facility, or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954 as amended, or pursuant to this Act, who obtains information reasonably indicating that such facility or activity or basic components supplied to such facility or activity -

(1) fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or

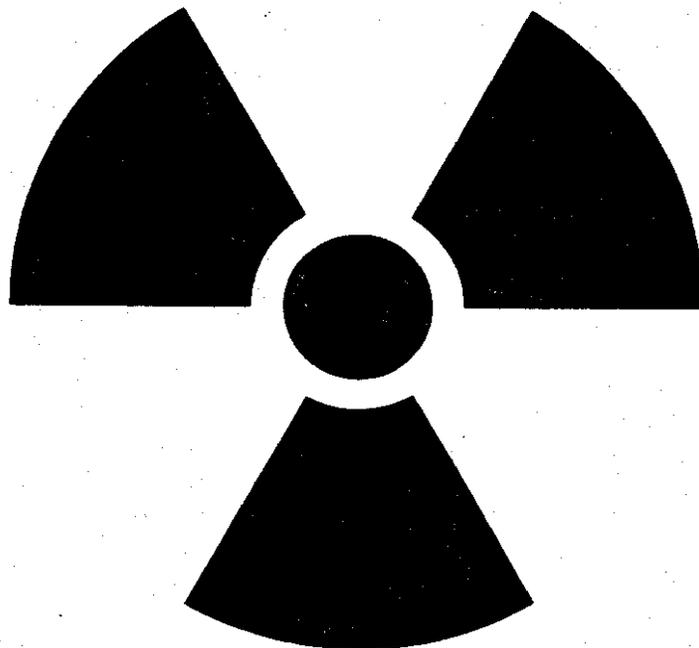
(2) contains a defect which could create a substantial safety hazard, as defined by regulations which the Commission shall promulgate, shall immediately notify the Commission of such failure to comply, or of such defect, unless such person has actual knowledge-that the Commission has been adequately informed of such defect or failure to comply.

(b) Any person who knowingly and consciously-fails to provide the notice required by subsection (a) of this section shall be subject to a civil penalty in an amount equal to the amount provided by section 234 of the Atomic Energy Act of 1954, as amended.

(c) The requirements of this section shall be prominently posted on the premises of any facility licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

(d) The Commission is authorized to conduct such reasonable inspections and other enforcement activities as needed to insure compliance with the provisions of this section.

# CAUTION



# RADIOACTIVE MATERIALS

## APPENDIX D – RADIATION TRAINING INFORMATION

### 1. TRAINING COURSES OFFERED BY TACOM-RI LICENSE STAFF

- a. The following courses are available for scheduling:

<u>TITLE</u>	<u>HOURS</u>
Tritium Awareness	1
Tritium Wipe Test Procedures	4
Introduction to TACOM-RI Commodities	8
Radioactive Material Handling Safety	28

- B. Radiation Safety Officer Refresher Training is available on the Army Electronic Product Support network.

### 2. TRAINING ROSTER

	<u>DSN</u>	<u>Commercial</u>	<u>Email</u>
Wayne Cook	793-2429	(309)782-2429	<u>CookW@ria.army.mil</u>
Training Fax	793-6758	(309)782-6758	

### 3. RADIATION SAFETY OFFICER CD ROM

U.S. Army Communications-Electronics Command  
Directorate of Safety Risk Management  
Radiological Engineering Division

Web Site: [www.sed.monmouth.army.mil/rdit/pages/da\\_rso.htm](http://www.sed.monmouth.army.mil/rdit/pages/da_rso.htm)

**RADIATION TRAINING INFORMATION – (Continued)**

---

This page is intentionally left blank.

## APPENDIX E – REFERENCES

AR 11-9	Ionizing Radiation Protection
AR 40-5	Preventive Medicine
AR 385-40	Accident Reporting and Records
AR 710-2	Inventory Management Supply Policy Below The Wholesale Level
AR 710-3	Asset Transaction Reporting System
AR 725-50	Requisitioning, Receipt, and Issue System
AR 740-26	Physical Inventory Control
Basic Radiation Protection Technology	D.A. Gollnick
MAM 99-13	Maintenance Advisory Message on MRS maintenance
Material Safety Data Sheet	Effective date 26 March 1990; by Radiological Consultants, Inc.
McGraw-Hill Encyclopedia of Science and Technology	
NRC License 12-00722-06	Tritium Fire Control Devices
TB 43-0116	Identification of Radioactive Items in the Army
TB 43-0137	Transportation Information for US Army Radioactive Commodities
Title 10 Code of Federal Regulations, Part 19 (10CFR19)	Notices, Instructions, and Reports to Worker; Inspections
Title 10 Code of Federal Regulations, Part 20	Standards for Protection Against Radiation

## CONTAMINATION ACTION LIMITS – (Continued)

---

Title 10 Code of Federal Regulations, Part 21	Reporting of Defects and Non-Compliance
Title 10, Code of Federal Regulations, Part 40	Domestic Licensing of Source Material General Provisioning
Title 49, Code of Federal Regulations, Part 49	Transportation
TM 3-261	Handling and Disposal of Unwanted Radioactive Material
TM 9-2350-200-BD	Battlefield Damage Assessment and Repair for M1, IPM1, and M1A1 Tank, General Abrams
TM 3-6665-312-12&P	Operator's and Unit Maintenance Manual for M8A1 Automatic Chemical Agent Alarm
TM 3-6665-312-30&P	Intermediate Direct Support Maintenance Manual for M8A1 Automatic Chemical Agent Alarm.
TM 3-6665-321-12&P	Operator's and Unit Maintenance Manual for Alarm Chemical Agent Automatic: M22
TM 3-6665-321-30&P	Direct Support Maintenance Manual for Alarm Chemical Agent Automatic: M22
TM 3 6665-331-10	Operator's Manual for Chemical Agent Monitor (CAM)
TM 3-6665-331-23&P	Unit and Direct Support Maintenance Manual for Chemical Agent Monitor (CAM)
TM 3-6665-343-10	Operator's Manual for Improved Chemical Agent Monitor (ICAM)
TM 3-6665-343-23&P	Unit and Direct Support Maintenance Manual for Improved Chemical Agent Monitor (ICAM)

TM 11-6665-208-15

Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual; RADIAC SET AN/PDR-54

TM 11-6665-251-10

Operator's Manual, RADIAC Set, AN/VDR-2



## APPENDIX F - SUMMARY OF LICENSE CONTAMINATION ACTION LIMITS

The following table summarizes the limits set by the TACOM-ACALA's Nuclear Regulatory Commission (NRC) license, 12-00722-06. The footnotes cite the originating authority of the limits, i.e., from NRC license, Regulatory Guides, NRC Code of Federal Regulations (CFR), and Department of Transportation (DOT) CFR.

Caveat: This table represents the upper levels at which action must be taken to either limit access and/or decontaminate. Whenever possible, decontaminate to "as low as is reasonably achievable" (ALARA) IAW Title 10 CFR 20.1101. Then take a second wipe test to ensure facilities and equipment are clean.

REMOVABLE CONTAMINATION ACTION LIMITS  
(Disintegration per minute (DPM) per 100cm<sup>2</sup>)

	RADIONUCLIDE		
	AM241	H3	NI63
UNRESTRICTED AREAS	20 <sup>1</sup>	1,000 <sup>1</sup>	1,000 <sup>1</sup>
CONTROLLED AREAS	220 <sup>2</sup>	10,000 <sup>3</sup>	10,000 <sup>3</sup>
RADIOACTIVE ITEMS	20 <sup>3</sup>	10,000 <sup>3</sup>	1,000 <sup>3</sup>
RADIOACTIVE PACKAGES	220 <sup>4</sup>	2,200 <sup>4</sup>	2,200 <sup>4</sup>

Footnotes:

1. Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June 1974, Table I, and/or Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, August 1987.
2. Regulatory Guide 8.23, Radiation Safety Surveys at Medical Institutions, January 1981, Revision 1, Table 2.
3. License application limit.
4. Title 49 CFR 173.443 and Title 10 CFR 20.1906.

**SUMMARY OF LICENSE CONTAMINATION ACTION LIMIT– (Continued)**

---

This page is intentionally left blank.