



**DEPARTMENT OF THE ARMY
HEADQUARTERS
U.S. ARMY MANEUVER SUPPORT CENTER AND FORT LEONARD WOOD
FORT LEONARD WOOD, MISSOURI 65473-5000**

FLW Regulation
No 11-1

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Army Programs
RADIATION SAFETY PROGRAM

Summary. This regulation establishes policy and guidance for the acquisition, possession, storage, transport, disposal, and use of radioactive material, sources, commodities and ionizing and non-ionizing radiation producing devices at Fort Leonard Wood (FLW), Missouri.

Applicability. This regulation applies to all elements of this command including United States Army Reserve, National Guard, tenant and satellite units, activities, directorates and civilian contractors. It applies to all personnel engaged in the acquisition, possession, storage, transportation, disposal, use and maintenance of ionizing and non-ionizing producing devices, commodities and sources in the performance of their duties. (For use of radioactive material and equipment for medical use, refer to MEDDAC Reg 385-11).

Forms. The –R forms located in the back of this regulation are authorized for local reproduction.

Supplementation. Supplementation of this regulation is prohibited unless specifically approved by Headquarters (HQ), United States Army Maneuver Support Center and Fort Leonard Wood.(MANSCEN & FLW)

Suggested Improvements. The proponent agency of this regulation is the Directorate of Logistics (DOL). Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Cdr, MANSCEN, ATTN: ATZT-DL-M, Fort Leonard Wood, MO 65473-5000.

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	Contents	Para	Page
Chapter 1: INTRODUCTION			
Purpose		1-1	1
References		1-2	1
Explanation of Acronyms, Abbreviations, and Terms		1-3	1
Responsibilities		1-4	1
Interpretations		1-5	3
Chapter 2: CONTROL OF IONIZING RADIATION SOURCES			
Control Procedures		2-1	4
Transportation Procedures		2-2	4
Controlled Items		2-3	5
Accountability and Control of Radioactive Material		2-4	5

This regulation supersedes FLW Reg 385-11, 17 June 1988.

Contents	Para	Page
Chapter 3: CONTROL MEASURES AND EXPOSURE STANDARDS		
General	3-1	6
Control Measures	3-2	6
Radiation Exposure Standards	3-3	6
Emergency Situation	3-4	7
Radiation Exposure of Nonoccupational Workers (General Public)	3-5	7
Other	3-6	7
Chapter 4: SPECIAL INSTRUCTIONS TO RADIATION WORKERS CONCERNING PRE-NATAL RADIATION EXPOSURE		
Purpose	4-1	7
Responsibility	4-2	7
Instructions	4-3	7
Radiation Badge Program	4-4	8
Chapter 5: MOVEMENT OF MILITARY EQUIPMENT CONTAINING RADIOACTIVE MATERIALS (MANEUVERS ONLY) INSTRUCTIONS		
Purpose	5-1	8
Applicability	5-2	8
General	5-3	8
Procedures	5-4	8
Administration of Policy	5-5	8
Radiation Safety	5-6	9
Point of Contact (POC)	5-7	9
Chapter 6: RADIOLOGICAL EMERGENCY PROCEDURES		
Introduction	6-1	9
General Procedures	6-2	10
Emergency Radiation Countermeasures	6-3	10
Ionizing Radiation Accident Reports	6-4	10
Chapter 7: STORAGE AND DISPOSAL OF UNWANTED RADIOACTIVE DEVICES AND RAD WASTE		
Unit Level Storage	7-1	10
Installation and Radioactive Waste Storage Facility	7-2	10
Turn in of Radioactive Devices	7-3	11
Turn in of Radioactive Contaminated Waste	7-4	11
Importance of Prompt Turn In of Items/Material for Disposal	7-5	11
Chapter 8: CONTROL OF NON-IONIZING RADIATION SOURCES		
Laser and High Intensity Light Sources	8-1	11
Radio Frequency Radiation (RFR)	8-2	12
Appendix A: References and Forms		13
Appendix B: Figures		14
Appendix C: Sample Safety Standing Operating Procedures (SOPs)		19
Appendix D: Warning Signs		25
Glossary		27

Chapter 1
INTRODUCTION

1-1. Purpose. This regulation establishes policies procedures and responsibilities for ionizing and non-ionizing radiation safety program (RSP). It covers safe handling, receipt, maintenance, storage, transportation, control and use of both ionizing and non-ionizing radiation sources.

1-2. References. Required and related references are listed in appendix A.

1-3. Explanation of Acronyms, Abbreviations, and Terms. Acronyms, abbreviations, and terms used in this regulation are explained in the glossary.

1-4. Responsibilities. The Installation Commander as overall responsibility for this program. Staff and other responsibilities are as follows -

a. FLW DOL will assign qualified personnel (on appointment memorandum) as the Fort Leonard Wood Radiological Safety Officer (FLWRSO) and alternate RSO (LRSO). These individuals will perform the primary duty as supervisors of the ionizing and non-ionizing RSP.

b. The FLWRSO will -

(1) Establish a formal RSP which is consistent with applicable regulations.

(2) Administer and manage the RSP.

(3) Provide appropriate monitoring equipment, supplies, and facilities to effectively manage the FLW ionizing and non-ionizing RSP.

(4) Enforce procedure prescribed by the Nuclear Regulatory Commission (NRC), Department of Transportation (DOT) and Department of the Army (DA) for safe use, handling, receipt, storage, transportation, packaging and disposal of radioactive material, devices, and waste.

(5) The FLWRSO will in accordance with (IAW) AR 40-5, and AR 11-9, initiate, implement, and supervise the Ionizing RSP.

(6) IAW AR 40-5 and applicable technical bulletin's (TBs), initiate, implement, and supervise the non-ionizing radiation program (NRP).

(7) Accomplish the following specific (but not limited to) duties -

(a) Keep the commander and Safety and Occupational Health Advisory Council (SOHAC) advised to all ionizing and non-ionizing related matters.

(b) Recommend appropriate corrective actions as applicable.

(8) Implement a RSP. The objective of this action would be to reduce radiation exposures to a level as low as is reasonably achievable (ALARA) within the occupational dose limits as set by the NRC and Army Regulations (ARs).

(9) Provide guidance to create safe radiation working conditions.

(10) Assure that operating procedures comply with current standards, pertinent regulations, and directives.

(11) Maintain -

(a) Radiation Program Files IAW AR 25-400-2.

(b) A current inventory of ionizing and non-ionizing radiation sources, devices, materials, instruments, equipment and radioactive waste.

(c) The ionizing radiation inventory will consist of licensed material/instruments of activity quantities which exceed the level as specified in the Code of Federal Regulations (CFR) 30.71, Title 10.

(d) The non-ionizing radiation equipment inventory will consist of equipment having the capability of exceeding the radiation power levels as specified in TB MED 523.

(12) Process and clear the transfer, disposal, and transportation of individually controlled sources (ICS). This is done ONLY with the approval of the radiation safety officer (RSO) at the United States Army Training and Doctrine Command (TRADOC) and the Army Major Command (AMC)-Major Subordinate Command (MSC) that controls the license of that source.

(13) Dispose of leaking sources IAW specified disposition instructions from AMC-MSC that controls the radioactive source.

(14) Take action to remove and store ICS when qualified Radiological Safety Officer (RSO), trained operators, or custodians are not available in a unit that uses or assigns ICS.

(15) Report radiation incidents which meet the criteria of AR 385-40; CFR, Title 10, Parts 20, 21, or CFR 171.15, Title 49. The report will be submitted to TRADOC, ATTN: ATBO-SO (RSO), Fort Monroe, VA 23651-5000 and to other HQ as indicated in the above references. Locally report all radiation releases to the FLW Fire Department and the Directorate of Environmental Compliance and Management (DECAM).

(16) Review the qualification of unit RSO's who have been appointed by commanders.

(17) Provide guidance for the receipt, storage, use, transfer, packaging, transportation, and disposal of radioactive materials/equipment, in addition to the safe use of potentially hazardous non-ionizing radiation equipment.

(18) Provide a listing of the types, quantities, type hazard, activity, locations, and POC of radioactive material/instruments to the FLW Fire Department, and FLW Provost Marshal.

(19) Furnish a copy of the appointment memorandum of the FLWRSO to TRADOC, ATTN: ATBO-SO (RSO), Fort Monroe, VA 23651-5000.

(20) Prepare/review all correspondence pertaining to the RSP. Units initiating correspondence on radiation-related matters will route their requests, advice, comments, etc., through the FLWRSO for necessary action.

(21) Keep the commander informed on all radiation matters within the installation. Correspondence will be routed through FLW DOL RSO (ATTN: ATZT-DL-M-RSO).

(22) Ensure that radiation safety policies are provided to personnel concerned; forwarding from Safety Office.

(23) Survey all incoming and outgoing radioactive shipment packages IAW AR 11-9, NRC License, applicable TBs and technical manuals (TMs). Incoming surveys not required IAW 10 CFR 20.1906 if less than Type A quantities, special form or gas. All movements of radioactive materials/instruments from the

installation by commercial means will be certified by the FLWRSO. U.S. Army Medical Department Activity (MEDDAC), and U.S. Army Chemical School will perform their own incoming and outgoing radioactive shipment packages surveys.

(24) The results of the radiation survey, wipe test, calculations, isotope activity, and other pertinent information required by CFR, Title 49, will be documented on FLW Form 851-R (Radioactive Material Movement) (see figure B-4).

(25) All instructions on FLW Form 851-R will be met by activities concerned prior to the shipment. All movement of radioactive materials/instruments from the installation by military conveyance for the purpose of maneuvers will be processed IAW the instruction in chapter five.

(26) Conduct semiannual radiation surveys to evaluate and document radiation hazards and other relevant data to specific operations involving receipt, handling, storage, use, maintenance, disposal or loss of control of radioactive materials. Violations will be reported IAW current regulations.

(a) Conduct quarterly Radiation Health Physics Surveys of radioactive waste storage at DOL Maintenance Complex, building 5265, and Central Turn-In Facility in supply.

(b) Conduct quarterly wipe tests for tritium (H-3) at radioactive waste storage, the optic repair room at DOL Maintenance Complex, building 5265, and Central Turn-in Facility in supply.

(27) Establish radiation areas and high radiation areas where warranted.

(28) Advise all units/activities on radiation posting requirements IAW AR 11-9, and NRC license.

(29) Ensure the proper collection, storage, segregation, packaging, documentation and shipment of radioactive waste IAW specific disposal instructions received from HQ, Operation Support Command (OSC), and applicable regulations. For detailed instructions, see chapter seven.

(30) Remain -

(a) Proficient in the operation and use of radiation monitoring instruments necessary to conduct an effective RSP.

(b) Current on radiation directives and changes that periodically occur. This should be done by attending radiation courses, seminars, and reading applicable regulations.

(31) Maintain this regulation by reviewing its contents and initiating corrective actions where necessary.

(32) The FLWRSO will be notified of the transportation of ICS within the installation support area.

(33) Communicate promptly with the appropriate level of command -

(a) To prevent or halt unsafe radiation practices that represent a serious radiation hazard.

(b) On actions that violate applicable regulations.

(34) Ensure that the FLWRSO radiation monitoring equipment is maintained in a high state of readiness and is calibrated in a timely manner.

c. The DOL Transportation Division will -

(1) Prepare shipping documents Government Bills of Lading (GBL) in compliance with CFR 172.200-205, Title 49, when applicable.

(2) Ensure that shipments of radioactive material/ equipment by commercial means are accompanied by FLW Form 851-R (see figure B-4) has been prepared and released by the FLWRSO.

(3) Notify consignees of pending radioactive shipments when applicable.

(4) Arrange for technical escorts IAW applicable regulations, and NRC license.

(5) Ensure that radioactive materials are only loaded with compatible cargo IAW applicable regulations, and NRC license.

(6) Submit a report of arrival by electronic means to the shipping installation when radioactive shipments are received in excess of quantities listed in CFR 30.71, Title 10, Schedule B.

(7) In addition to oral briefing, provide personnel engaged in off-post transportation of radioactive material with a completed DD Form 836 (Dangerous Good Shipping Paper/Declaration and Emergency Response Information of Hazardous Materials Transported by Government Vehicles/ Containers/Vessels). This document should be supplemented with written emergency procedures.

d. The DOL/Supply and Services Division will -

(1) Provide the following for radioactive materials, equipment, and radioactive waste storage room.

(a) A turn-in point.

(b) Adequate storage facilities pending disposition instructions.

(2) Request disposition instructions for radioactive material/equipment from appropriate commodity National Inventory Control Point (NICP).

(3) Prepare a DD Form 1348-1A (Department of Defense (DOD) Single Line Item Release/Receipt Document), and provide a copy to the FLWRSO for necessary administrative processing of FLW Form 851-R (see appendix B), certification statement, and other necessary information pertinent to the shipment.

(4) Accomplish packaging IAW CFR, Title 49, and FLW Form 851-R provided by the FLWRSO.

(5) Ensure that radioactive components are not damaged when loading and unloading radioactive containers.

(6) Perform transportation, packaging, shipments, receiving activity responsibilities, storage areas, inventory of commodities at supply activities, and control and surveys of storage areas IAW AR 11-9.

(7) Inform the FLWRSO of all incoming/outgoing shipments of ICS as listed in chapter two. This equipment requires special controls and handling procedures. As a minimum, the documentation will include: national stock number (NSN), description of equipment, serial number, isotope, activity and equipment quantity, shipment number, mode of shipment, shipped from, shipped to, date of manufacture (if available), and name of manufacturer (if available).

e. Commander, MEDDAC will -

(1) Appoint a RSO to provide protection for the MEDDAC's mission area.

(2) Provide for a RSP to all organizations within the MEDDAC IAW AR 11-9, and other directives as applicable.

(3) Provide medical examinations and surveillance to personnel who are potentially exposed to -

(a) Ionizing radiation (see requirements in AR 11-9, and DA Pam 40-18).

(b) Non-ionizing radiation (see requirements in AR 11-9 and TB MED 523).

(4) Provide dosimetry service to those units/activities that have specific support agreements with the MEDDAC for dosimetry service.

f. The Directorate of Public Works (DPW), Fire Prevention and Protection Division will -

(1) Provide procedures for fighting fires involving radioactive materials.

(2) Provide protective clothing and devices to include respirators to radiation emergency fire fighting personnel.

(3) Maintain a current inventory of all ionizing radiation sources and their locations.

g. Commanders, Property Book Officers (PBO), and Accountable Property Officers will -

(1) Ensure that all ICS for which they are accountable, are stored, handled, and used in authorized areas and operated by trained personnel only (see chapter two).

(2) Notify the FLWRSO of receipt, transfer, and turn-in of items listed at appendix B. The data submitted will include the complete identification of the equipment IAW para c(7) above.

(3) Ensure that all radioactive material/equipment is inventoried annually. This action must be reported to the FLWRSO IAW AR 11-9 and reported not later than (NLT) 31 March annually.

(4) Report all ionizing and non-ionizing radiation incidents to the FLWRSO in a timely manner. The FLWRSO is located in the DOL Maintenance Division, building 5265. The Installation Staff Duty Officer (SDO) is to be called for assistance after duty hours.

(5) Store all radioactive materials IAW applicable TMs, NRC license, and appropriate ARs.

(6) Maintain accountability of Chemical Agent Detector (M43A1) (Detector Cell), Chemical Agent Monitor (CAM) (Cell Module), and the M22 Alarm Chemical Agent Detector Automatic (ACADA) (Cell Module), at all times. The applicable transactions will be reported IAW AR 710-3 to the DOL management section.

(7) Turn-in radioactive material/equipment and dispose of radioactive waste IAW this and appropriate ARs.

(8) Comply with instructions for movement of radioactive material/equipment for maneuvers as specified in chapter five.

(9) Post warning signs on both ionizing and non-ionizing radiation sources when required.

(10) Ensure that equipment containing unserviceable radioactive materials, or that has been in an accident, fire, or damaged in any way, is handled as follows -

(a) With disposable gloves.

(b) Placed in a plastic bag.

(c) Promptly shipped in a fiberboard box with all seams taped, to the unit's maintenance support for specific item. (For detailed guidance in handling and transporting radioactive materials/equipment, see chapters two and six.)

h. The Directorate of Contracting (DOC) will notify non-Army agencies, i.e., contractors, who want to use radioactive materials on Army property, of the requirements:

(1) Of AR 11-9, to acquire an Army permit.

(2) To restore Army property to NRC unrestricted use criteria. (This will be made a part of the contract or lease by the DOC IAW AR 11-9.)

i. Radiation workers will -

(1) Keep abreast and follow standard operation procedures (SOPs), rules, and special instructions.

(2) Use safety and monitoring equipment properly.

(3) Report to supervisor, any accident, unusual incident, personal injury (however slight), suspected overexposure, and suspected internal exposures, as soon after occurrence as possible.

j. Commanders and Directors will -

(1) Ensure qualified personnel are designated on appointment memorandum as nuclear biological chemical (NBC) NCO and LRSO in units and installation activities that handle radioactive material. Compasses and watches not required LRSO.

(2) Ensure that copies of appointment memorandum are forwarded to the FLWRSO, ATTN: ATZT-DL-M (RSO), Fort Leonard Wood, MO 65473-5000.

(3) Ensure adequate resources are provided for training of personnel.

1-5. Interpretation. Nothing in this regulation will be interpreted to negate or supersede any requirement of the following: NRC; DOT; or ARs pertaining to ionizing and non-ionizing radiation policies.

a. Guidance provided in this regulation implements the following documents on Army policies, procedures, and standards for protection of personnel from exposure to ionizing and non-ionizing radiation sources -

(1) Applicable Code of Federal Regulations (CFRs).

(2) ARs

(3) TMs

(4) TBs

b. The policies, procedures, and standards for the protection of personnel for radiation health purposes are applicable to both ionizing and non-ionizing radiation sources, and include -

(1) Radioactive source materials, devices, instrument and components.

(2) Industrial heating, radio frequency (RF), and communication systems.

(3) Laser radiation systems (light amplification by stimulated emission of radiation), and high intensity optical sources.

c. Definitions. Definitions applicable to these regulations are found in the CFR, Titles 10, 29, 39, and 49; AR 40-5, AR 11-9, TB MED 521 and TB MED 523. This command is committed to the operating philosophy of maintaining occupational radiation exposure ALARA.

d. RSP Administrative Procedures. Procedures for administration of the RSP are specified in CFR, Titles 10, 29, 49; AR 11-9 and NRC Licenses.

e. In the event of misinterpretations or conflicting instructions, the most stringent requirements will be enforced.

f. These procedures will be reviewed and updated as required to ensure compliance with stated regulations/directives.

(5) Losses of Radioactive Materials/Equipment. A loss of any radioactive material/equipment will be reported immediately to the FLWRSO. Depending on the isotope and quantity of activity, it may become a significant hazard if allowed to get into the possession of unauthorized and untrained personnel.

(6) Excess. Radioactive material/equipment may only be disposed of through normal supply channels after coding.

(7) Disposal of Serviceable/Unserviceable Radioactive Material/Equipment. Under no circumstances may radioactive material/equipment be disposed of in trash cans or trash dumpsters. All radioactive materials/equipment, regardless of serviceability, will be turned in through supply channels for eventual transfer to an authorized facility.

(8) Transportation. The transportation of radioactive materials will be transported in compliance with the requirements of Title 49 CFR, AR 11-9, NRC license and this regulation.

(9) Accidents. Any accident, fire, or exposure of personnel with these sources, will be reported, without delay to the FLWRSO. See chapter six for additional guidance on radiological emergency procedures.

b. Activities requiring radioactive materials will be in compliance with the NRC license and applicable TMs that enough safety equipment, facilities, and trained personnel are available for the safe handling, use, and storage of this equipment. If at any time these standards cannot be met, notify the FLWRSO immediately so that corrective measures may be taken to safeguard these sources.

Chapter 2

CONTROL OF IONIZING RADIATION SOURCES

2-1. Control Procedures: Most radioactive items or equipment, in the U.S. Army, are safe when published usage instructions are followed. A listing of individually controlled items and controlled items is in figure B-1. Nevertheless, these items may become damaged, taken apart, stored in large quantities, contaminated, or used improperly by untrained personnel thus creating a potential hazard. To ensure for the safety of all times. The following control procedures are primarily designed for individually controlled and controlled radioactive items, but may also apply to other radioactive equipment as indicated. The following information/transactions will be reported to: FLW MANSCEN Safety Office, and FLWRSO for proper coordination, guidance, and action as may be required, to ensure for the safety of all concerned.

2-2. Transportation Procedures.

a. Most of the above equipment requires special handling when transported off the installation. The following procedures will be adhered to prior to transporting this equipment off the installation by commercial means.

a. Information/Transactions -

(1) Request for and receipts of radioactive commodities in the DoD supply systems must meet the requirements of AR 11-9 before a unit is allowed possession of the equipment.

(1) The FLWRSO will be notified of impending movement or shipment.

(2) Transfer of radioactive material controlled items. The FLWRSO must be informed of the intent in order that proper radioactive movement documentation, survey, wipe test, packaging and other requirements are met prior to the transportation of the equipment.

(2) Items will be offered for transportation will comply with 49 CFR.

(3) Qualifications of personnel operating AN/UDM-2 calibrator, AN/UDM-6 calibrator, and MC-1 Asphalt and Soil Density Gauge. Only qualified and certified RSO's, LRSO's, custodians, and operators are authorized to operate this equipment. They must be certified by completing an appropriate course. Upon completion of course, a copy of certification will be forwarded to the FLWRSO.

(3) A FLW Form 851-R (see appendix B) will be prepared by the FLWRSO.

(4) Annual Inventory of all ionizing radioactive materials/equipment. This inventory is required annually IAW AR 11-9. It will be submitted in the following format to, ATTN: ATZT-DL-M (RSO), NLT 31 March of each year. Serial numbers will be required on items listed in para B-1.

(4) A survey will be conducted by the FLWRSO to determine radiation levels and transportation index if applicable.

(5) Two appropriate radiation level labels will be affixed to opposite sides of the outer shipping container when required.

(6) A wipe test will be performed IAW Title 49 CFR 173.443 on the surface of the shipping container to determine if contamination exists. This is not to be confused with a radiation leak test, which is performed to determine if a source is leaking.

(7) Unless otherwise informed by the FLWRSO, these items require specific packaging, shipping paper, certification, markings, and labeling IAW Title 49 CFR.

- Organization
- Nomenclature
- National Stock Number (NSN)
- Quantity
- Building number
- POC
- Date of Inventory

b. There are instances when the U.S. Army must expedite the movement of equipment containing radioactive sources in order to accomplish the assigned mission in a timely manner. U.S. Army is authorized to deviate from the procedures in paragraph 2-2a above under the following circumstances -

(1) When movements are for the purpose of national security or an emergency refer to Title 49 CFR 173.7.

c. Calibration activities technical measurement diagnostic equipment (TMDE) may transport their calibration radioactive sources provided the following procedures are complied with -

- (1) An RSO is appointed to supervise the movement.
- (2) Calibration radioactive sources must be transported in an enclosed military van/vehicle.
- (3) The appropriate movement form FLW Form 851-R or FLW Form 846-R (Radiation Material Movement Form (Maneuver Only)) will accompany the shipment. See appendix B-2, B-3, and B-4.
- (4) The movement is conducted IAW 49 CFR, part 172 and 173.
- (5) The FLWRSO will be notified of date of impending shipment and given a copy of applicable form for individually controlled items.
- (6) For the transportation of customers' radioactive materials/equipment, the calibration facility must comply with Title 49 CFR.

d. For the transport of radioactive materials/equipment by commercial means, see Title 49 CFR 100 to 177.

e. The installation may be cited with a serious violation if these instructions are not adhered to, therefore, no deviations are authorized unless approved by the commander.

2-3. Controlled Items.

a. The Radioactive Test Sample MX-7338/PDR-27 is a test sample containing krypton 85. This item is organic to Radiacmeter Set AN/PDR-27 and maybe used for testing the Radiacmeter. For disposal of the test sample contact the FLWRSO. Under no circumstances will the purple end of the MX-7338 be handled with your bare hands or stored in your clothing. Turn in the unserviceable test sample as radioactive waste through your supply channels.

b. The destruction or loss of subject items will be reported immediately to the FLWRSO.

c. The handling, storage, transfer, use, and disposal of all items in appendix B, figure B-1, paragraph 1 and 2 will be monitored by the FLWRSO. These functions will comply with the requirements of AR 11-9 and appropriate NRC regulations.

d. An inventory, by serial number, is required semiannual on the items listed in appendix B, figure B-1, para 1 and 2. The results will be combined with the semiannual inventory of radioactive materials report and forwarded to ATTN: ATZT-DL-M (RSO), Fort Leonard Wood, MO 65473-5000.

e. A leak test must be IAW the NRC license and TB 43-180. The test will be performed by qualified personnel as requested by the licensee of the end item.

f. The items listed in figure B-1 are extremely dangerous under the wrong circumstances and may present hazardous conditions, unsatisfactory radiation exposures, and contamination of personnel when handled improperly. Therefore, all users of these items will follow the instructions in applicable TM and NRC License. If there are any questions, contact the FLWRSO immediately.

2-4. Accountability and Control of Radioactive Materials -

a. The handling and use of equipment containing radioactive materials demand that special procedures be observed due to potential ionizing radiation hazards, or the radio toxicity of the isotope installed in the equipment, or both. The license for the equipment will stipulate the procedures to be observed in order to provide for your safety and to satisfy the NRC requirements for a license. In order to be in compliance and prevent violations from occurring, all personnel must adhere to the instructions in the commodity TM, NRC license and AR 710-3.

b. In order to ensure the safety of everyone concerned, all units, maintenance activities, and personnel will adhere to the instructions in the references of paragraph 2-4a above and the following:

(1) M43A1 Detector Agent Detector, chemical agent monitor (CAM), and improved chemical agent monitor (ICAM) must be wipe tested for contamination within a year or 12 months, the unit is responsible for submitting the radioactive items mentioned above to TMDE Support Center, and DOL Maintenance Division for appropriate wipe testing.

(2) The M43A1, CAM, and ICAM Cell Module are tracked by serial number, IAW AR 710-3, by the licenses. The local Radiation Testing and Tracking System (RATTS) is managed by the DOL material management section.

(3) The M22 ACADA annual leak testing is only required when depot level maintenance is performed, specifically when the cell module is replaced.

(4) Users/operators will be trained IAW the instructions in the applicable TM as a minimum. Available videos at Training Support Center (TSC) may be used for this training.

(5) The radioactive materials mentioned must be stored in accordance with the applicable TM, and the licenses.

(6) For transportation or shipment of radioactive materials refer to the TMs, TBs, and the licenses.

(7) Do not eat, drink, smoke, or chew gum or tobacco, or apply cosmetics in the vicinity of any radioactive materials.

(8) Always handle the radioactive materials in accordance with the TM.

(9) In case of an accident or fire with the radioactive materials, refer to chapter six, Radiological Emergency Procedures, this regulation.

(10) Maintenance personnel must have received a minimum of radiation safety training required IAW the TM, and the license.

(11) Maintenance personnel must follow the applicable TM for maintenance procedures.

(12) A semiannual inventory to account for detector cell modules is required. The inventory will include the quantity, type of isotope, location of detector cell, serial number of detector and cell module, and date of inventory.

c. Radiation Protection at User Level: If a radioactive material mentioned in figure B-1 is involved in an accident, fire or damaged in any way, observe the following procedures -

(1) Notify your nuclear biological chemical (NBC) noncommissioned officer (NCO)/Officer and the FLWRSO immediately. The damaged radioactive materials and surrounding area will be assumed contaminated until proven otherwise. The area of the accident will be cordoned off, movement of personnel in or out of the area monitored and

controlled. If any contamination above background is detected with an appropriate Radiacmeter, it is considered to be leaking and contaminated. Contact the FLWRSO for instructions before proceeding any further. In most instances, an appropriate radiacmeter will not be available. Proceed as follows: Put on disposable plastic gloves, using a shovel place the damaged detector and surrounding debris inside a clear double plastic bag, and place in a fiberboard box with all the seams taped. The damaged radioactive materials will be evacuated to the U.S. Army TMDE Support Operation, and DOL maintenance division. If skin contact is made with any contaminated object, wash immediately with non-abrasive soap and water until such time that zero contamination is noted on skin. All possible precautions must be taken to prevent the ingestion or inhalation of radioactive particles.

(2) In the event of fire, airborne contamination must be considered. The fire should be fought upwind of the fire and fire fighters should wear portable air systems.

(3) Decontamination of accident area will be done under the supervision of the NBC NCO/Officer or the FLWRSO.

(4) For detailed radiological emergency procedures, see chapter six, this regulation.

d. Radiation protection at maintenance level. Upon receipt of a damaged/unserviceable M43A1 Detector, M22 ACADA, CAM, and ICAM observe the following procedures -

(1) The maintenance activity will abide by the procedures delineated in NRC License, TM 3-6665-312-30&P, TM 3-6665-321-12&P, and TM 3-6665-331-23&P and other applicable publications.

(a) The TMDE Support Center, and DOL Maintenance Division must have a calibrated active detection equipment.

(b) The TMDE support unit, and DOL Maintenance Division must abide by the serial number tracking requirements of AR 710-3, Chapter two, Asset Transaction Reporting System.

(2) Dispose of all material that may become contaminated, such as, gloves, swipes, and work bench paper, by placing in a clear double plastic bag, label radioactive waste, isotope, and place in a radioactive waste container until it is turned in to the FLWRSO.

(3) Refer to AR 710-3, Chapter four, Section II for the accountability and completion of transaction cards at maintenance level.

Chapter 3

CONTROL MEASURES AND EXPOSURE STANDARDS

3-1. General.

a. External Exposure: Occupational exposure to ionizing radiation may occur as a result of the individual's employment or duty. Numerous items of military equipment contain radioactive materials; consequently, absorbed radiation doses may be incurred during the handling, procurement, receipt, transfer, shipment, use, storage and/or maintenance of equipment containing radioactive sources. Normally, the radiation levels of U.S. Army equipment containing radioactive materials are low and considered extremely safe for use, provided that the radioactive sources are not damaged, burned or removed when unauthorized.

b. Internal Exposure: When radioactive equipment becomes damaged, it must be assumed that the source is leaking; therefore, the area adjacent to the radioactive source will become contaminated. When this occurs, personnel handling the source

may become contaminated and the probability of ingesting the radioactive particles increases. These particles may enter the body through open wounds, nose, mouth and possibly through the skin pores. Once inside the body, the radioactive particles may accumulate in the various critical organs of the body, radiate, and cause cell damage.

c. As can be seen by the above statement, even low levels of radioactive activities and radiation exposures are undesirable and must be controlled at all times. Following the procedures provided in equipment TMs refraining from smoking, eating, and drinking liquids, handling contaminated equipment with surgeon's gloves, washing your hands, monitoring your body and clothing when leaving radiation areas will reduce the probability of contamination and radiation exposure.

3-2. Control Measures. Every effort will be made to keep the total radiation dose ALARA. The following procedures, when followed, will ensure your safety and reduce exposures to a minimum:

a. Time: Before entering a radiation area, pre-plan the steps you must accomplish, perform your task and remove yourself from the radiation area. This procedure will drastically reduce the amount of radiation exposure.

b. Distance: When exposing yourself to a radioactive source, maintain the maximum distance possible between you and the source, do your assigned task, and again, increase the distance to the source while you are involved in performing other unrelated procedures.

c. Shielding: There are instances when your duties may require you to handle sources which exceed the adopted exposure standards. In these instances, appropriate shielding must be placed between you and the source to ensure your safety. If in doubt, contact the FLWRSO for advice.

d. Do not eat, drink, smoke, or chew gum or tobacco when handling radioactive materials.

e. Do not touch individually controlled, controlled or suspected leaking/contaminated radioactive sources with your bare hands. Wear protective disposable gloves.

f. Monitor yourself for contamination and wash your hands when leaving a radiation area.

g. Always wear your radiation badge when the probability of radiation exposure exists.

h. Knowledge of Radiation Program: Read the TMs applicable to the radioactive equipment you are to be exposed to. Knowing your equipment will build your confidence and respect for it and assist you in practicing safe habits when working with radioactive equipment.

i. Although there are many steps and procedures that one may practice in order to reduce radiation exposure, the individual must evaluate the necessity for exposure and weigh it against the benefits expected.

3-3. Radiation Exposure Standards. Radiation exposure standards for the control of occupational exposure to ionizing radiation will be IAW the guidelines established in AR 11-9, 10 CFR 20, and 29 CFR 1910. These levels are the maximum authorized and should never be exceeded, except for life-saving situations when authorized by proper authority. All efforts will be made by everyone concerned to reduce these levels to ALARA.

a. The Total Effective Dose equivalent will not exceed the limits specified in 10 CFR, part 20.1201 (5 roentgen equivalent mammal (Rem)). The sum of the deep dose equivalent and the committed dose equivalent will not exceed the limits specified in

10 CFR part 20.1201 (50 Rem). The dose to the lens of the eye will not exceed the limits specified in 10 CFR 20.1201 (15 Rem). The shallow dose to the skin or any extremity will not exceed the limits specified in 10 CFR 20.1201 (50 Rem).

b. Persons who are classified as non-radiation workers or minors will not be exposed to a whole body dose IAW the guidelines established in AR 11-9, 10 CFR 20, and 29 CFR 1910.

c. Female employees who are occupationally exposed to ionizing radiation have the responsibility to inform their supervisor when pregnant. Special consideration may be necessary to ensure that her radiation dose levels do not exceed the radiation exposure standards IAW the guidelines established in AR 11-9, 10 CFR 20, and 29 CFR 1910.

d. Any person that knows or believes that he/she has been overexposed, will immediately notify the FLWRSO and medical facilities.

3-4. Emergency Situation. Radiation exposure standards adopted for the control of planned occupational exposures, under emergency situations, are as follows -

a. Lifesaving Situations - (to protect injured persons)

(1) Accumulated absorbed dose to the whole body shall not exceed 100 rad.

(2) Accumulated absorbed dose to the hands and forearms shall not exceed 300 rad.

b. Less Urgent Situations (to protect property, control fires, or minimize the release of effluents) -

(1) Accumulated absorbed dose to the whole body shall not exceed 25 rad.

(2) Accumulated absorbed dose to the hands and forearms shall not exceed 100 rad.

c. Rescue Personnel -

(1) Rescue personnel must be knowledgeable and informed in the basics of the potential consequences of exposure to ionizing radiation, proper use of radiation protective devices and clothing, and in rescue operations and techniques. These personnel normally receive training in emergency operations by virtue of their assignment in Military Police units, Fire Departments, Explosive Ordnance Detachment (EOD), Radioactive Material Escorts, or specially trained NBC units.

(2) In the absence of trained rescue personnel, volunteers may be used, provided they are briefed in the proper safety and health procedures to be used in the specific operation before being exposed to a potential radiation hazard. If in doubt, contact your NBC Officer and FLWRSO.

3-5. Radiation Exposure for Nonoccupational Workers (General Public). Exposure to these persons will be limited to accumulated dose to the whole body not to exceed amount milliroentgen equivalent man (milliRem) IAW the guidelines established in AR 11-9, 10 CFR 20, and 29 CFR 1910 in one calendar year. This excludes natural background radiation, medical and dental exposures.

3-6. Other. Standards that are less restrictive than those prescribed above may be used only when approved by the Surgeon General. Members of the general public for whom the exposure is considered to be non-occupational exposure to ionizing radiation.

Chapter 4 SPECIAL INSTRUCTIONS TO RADIATION WORKERS CONCERNING PRE-NATAL RADIATION EXPOSURE

4-1. Purpose. These instructions provide the necessary information to radiation workers, co-workers, and management concerning the risks of pre-natal radiation exposure.

4-2. Responsibility. AR 11-9, indicates that when a female radiation worker becomes pregnant or believes she is pregnant, it is her responsibility to notify her employer of this fact so that special consideration may be given to ensure that her radiation dose does not exceed the radiation exposure standards.

4-3. Instructions.

a. The NRC has established basic radiation exposure limits for all occupationally exposed, and individuals under 18 years of age and the general public per calendar quarter or one-tenth of the occupational limit.

b. A special situation arises when a female occupationally exposed worker becomes pregnant. Therefore, increasing the probability of the unborn child's exposure to radiation as a result of the mother's duties. The NRC has recommended that because the unborn are much more sensitive to radiation than adults, their radiation dose from occupational exposure of the mother should not exceed .5 roentgen equivalent mammal (rem) (500 milliroentgen equivalent man (milliRem)) during the entire gestation period. This applies to the full nine-month pregnancy. Because the risks of undesirable effects are potentially greater for unborn children, the National Council on Radiation Protection and Measurement also stresses the need to keep radiation doses to the fetus ALARA.

c. The unborn child is more sensitive to radiation than an adult because of its rapid rate of development. Cells forming a specific and critical organ are dividing very rapidly and are more susceptible to being mutated by ionizing radiation. The unborn's organs for fighting infections and harmful substances are not yet fully developed and are extremely vulnerable. Although, caution must be practiced at all times, it must be emphasized that a very small percentage of birth defects are attributed to radiation exposure in comparison to measles, smoking, alcohol consumption, age, drugs and other factors that might have an effect on birth defects. One in approximately 3,500 birth defects may be attributed to radiation exposure according to the NRC Regulatory Guide 8.13.

d. An expectant mother should know that the first three months of pregnancy are extremely critical, that the unborn baby's radiation exposure will be less than the mother's exposure due to the dose absorbed by the mother's body, and that large doses of radiation can cause birth defects in the unborn. There are several alternatives a mother may wish to consider to reduce the risks of radiation exposure.

(1) Consult with your medical facilities. They can provide additional up-to-date technical information on the risks of radiation exposure.

(2) Seek the guidance of the FLWRSO.

(3) Practice radiation safety at all times and observe the three key words whenever possible: TIME, DISTANCE, and SHIELDING. They are designed to keep your radiation exposure ALARA. See chapter three for detailed instructions on control measures and exposure standards.

(4) Do not eat, drink, smoke, or chew gum or tobacco, or applying cosmetics when working around radioactive materials.

Open cuts are also extremely vulnerable to absorbing internal radioactive contamination.

(5) Keep in mind that a mother may be exposed to both external and internal radiation which may enter the mother's body and cross into the baby's body.

(6) Consider being temporarily reassigned, delay having children, or discontinue assignment in a radioactive work area.

e. Pregnant women are responsible for informing their supervisors promptly of their pregnancy in order that appropriate measures may be taken to limit the total radiation dosage to the unborn child. Reassignment shall entail no loss of job security or economic penalty to the radiation worker.

4-4. Radiation Badge Program. The above instructions will be presented to applicable personnel in the Radiation Badge Program. A written copy will also be made available to occupationally exposed women, in addition to a copy of NRC Regulatory Guide 8.13.

a. A copy of the annual summary of the Automated Dosimetry Records (ADRs) maintained permanently in the individuals' medical file.

Chapter 5 MOVEMENT OF MILITARY EQUIPMENT CONTAINING RADIOACTIVE MATERIALS (MANEUVERS ONLY) INSTRUCTIONS

5-1. Purpose. To establish basic policies, procedures, and responsibilities pertaining to the movement of military equipment containing radioactive materials during training exercises and maneuvers.

5-2. Applicability. The policies established by these instructions are applicable to all units and activities assigned or attached to the United States Army Engineer Center and FLW.

5-3. General. The Army is exempted from labeling requirements of 49 CFR 172 and 173 under 49 CFR 172.400a provided the radioactive material is loaded and unloaded under DoD personnel supervision and is escorted by DoD personnel during transit.

a. Ensures that units are familiar with the types and hazards associated with radioactive materials to include proper reaction in the event of fire or accident.

b. Keeps the FLWRSO informed of the whereabouts of radioactive materials so that in case of an accident, the FLWRSO can react and provide appropriate guidance and assistance as may be required.

c. Expedites the movement of equipment during training exercises/maneuvers.

5-4. Procedures. This exemption is applicable provided the following procedures are adhered to:

a. Appropriate personnel must accompany the radioactive material/equipment during the movement. These persons may be Active Duty, Reserve, National Guard or DA civilians.

b. Military radioactive equipment, which is consigned, is not exempted except for rail shipments of radioactive equipment if properly escorted by above personnel.

c. Accompanying personnel will be familiar with the types of radioactive materials being transported.

d. They will be familiar with the associated hazards and emergency procedures to be followed in case of an incident or fire.

e. An inventory of equipment containing radioactive material will be performed by the unit and documented on FLW Form 846-R. See appendix B.

f. A visual inspection of the radioactive materials/ equipment will be conducted by unit personnel and documented in FLW Form 846-R, item 4 by the unit's radiation safety personnel. The visual inspection is to ensure that damaged and potentially contaminated radioactive equipment is removed from use and turned into support prior to the unit departing from the installation or maneuver area.

g. A properly documented FLW Form 846-R will be initiated and distributed by the unit to the FLWRSO and Transportation Officer, DOL prior to departing the installation on maneuvers.

5-5. Administration of Policy. In order to ensure that the above procedures are complied with, each unit will adhere to the following instructions.

a. Ensure there is an assigned responsible individual at the designation site to ensure the policies and procedures are followed.

b. The units will order the FLW Form 846-R through the installation's publication channels. This form is to be completed as follows:

(1) The date, shipment number, paras three and five will be completed immediately after being notified of an impending field exercise.

(2) FLW Form 846-R, item five requires an inventory of equipment containing radioactive materials by each company/battery size unit. In order to prevent any future delays, the inventory will be conducted, posted, and kept current at all times by filling out all columns permanently except for the quantity column. The quantity column will be filled out only after an exercise is announced and the total quantity to be transported off the installation by unit has been determined.

(3) The initial inventory of radioactive material may be time consuming, therefore, the following sources of information will assist you in determining what equipment is radioactive:

(a) An inventory of radioactive materials is conducted and reported by your unit annually, therefore, the information you require should be available in your unit's supply channels.

(b) TB 43-0116 lists all equipment in the Army inventory containing radioactive materials except for medical or nuclear weapons.

(c) To ensure that all possible radioactive equipment have been identified, check all the NSNs of your property book in the Army Master Data File (AMDF). If the special control item code (SCIC) column indicates an 8, or any of the following letters: A, B, F, G, H, K, S, T, U, W, X, it is radioactive.

(4) Visual Inspections.

(a) The visual inspection of radioactive equipment will be performed at times specified and documented in item four of the FLW Form 846-R by the unit RSO affixing his signature and date in appropriate line. The unit RSO may utilize other key personnel to expedite and assist on the visual inspection. The objective of the visual inspection is to ensure to the commander that unserviceable, damaged, or potentially leaking or contaminated sources are identified and turned into maintenance support prior to transporting this equipment on public highways. Small and

numerous items of equipment, such as wrist watches and compasses may be inspected when being turned in for storage within the unit's storage facility. These items may be assumed to be serviceable as long as they remain secured in storage, thus, no delays should be encountered in the visual inspection of these large quantities of equipment. Radioactive equipment which remains in a packaged condition during an exercise will not be opened for the sake of verifying its status during the visual inspection unless the package has been opened or damaged in transit.

(b) When the visual inspection and loading of radioactive equipment has been completed, the unit RSO will spot check for proper storage of sensitive radioactive equipment, which could easily become damaged during transit, and complete FLW Form 846-R, item four. The unit RSO will then notify his unit commander to verify its contents.

(5) The unit commander will sign the signature block of FLW Form 846-R after verifying its information.

(6) The unit's representative will distribute FLW Form 846-R as follows:

- (a) One copy to the FLWRSO.
- (b) One copy to the DOL Installation Transportation Officer.
- (c) One copy to accompany the unit throughout the exercise.

(7) As the exercise progresses, the unit RSO will complete part of FLW Form 846-R at times designated. Upon completion of the exercise and return to the installation, the units completed FLW Form 846-R will be forwarded to the FLWRSO.

5-6. Radiation Safety: Radiation safety is of the utmost importance to the U.S. Army and its personnel who handle radioactive materials/devices. As a minimum, the following procedures will be observed at all times.

- a. Radioactive sources will never be handled with bare hands. This applies to controlled sources and leaking/contaminated radioactive equipment.
- b. Eating, drinking, smoking, and chewing gum or tobacco or applying cosmetics are prohibited while handling radioactive materials.
- c. Fire extinguishers containing a dry chemical, such as carbon dioxide, or water sprayed as fog, may be used on radiological fires. This will prevent the spread of potential contamination.
- d. Disposal of radioactive components/waste will be IAW published regulations and turned in through supply channels.
- e. Exposure to radiation will be kept to a minimum by observing time, distance, and shielding.
- f. Accidents or fires with radioactive materials/equipment will be reported to the FLWRSO on a timely basis.
- g. See chapter six for detailed instructions on emergency radiological procedures.

5-7. Point of Contact (POC). The unit RSO is the focal point of contact at a unit on matters related to radioactive materials. The unit RSO will be familiar with the safety and emergency procedures to be implemented in case of a fire or accident with radioactive materials. The unit RSO will contact the FLWRSO. The FLWRSO will advise the owners of radioactive equipment that unserviceable, damaged, or potentially contaminated

instruments must be identified, placed in a plastic bag and evacuated to appropriate support. The unit RSO will advise the commander of the inventory, identification, inspection, and storage of equipment containing radioactive materials in addition to any other matter related to radioactive materials. Should an incident occur with radioactive equipment, while in remote location from the installation, the following procedures will be enforced :

- a. Contain the area of the incident/fire.
- b. Keep personnel out of the contained areas.
- c. Monitor the area for contamination (if proper equipment is available).
- d. During an accident or fire with radioactive equipment, one must assume that leakage and contamination will exist until proven otherwise with appropriate monitoring equipment. If in doubt on any radiation matter, consult with the unit commander or NBC Officer. If the above are unavailable, the senior person present takes charge and implements the radiological emergency procedures of chapter six, in this regulation.

Chapter 6 RADIOLOGICAL EMERGENCY PROCEDURES

6-1. Introduction. A radiological emergency may exist when there is a potential to overexposure to or contamination of personnel by ionizing radioactive materials is present or imminent. The emergency may result for numerous reasons, such as, fire, explosion, source leakage, theft or loss of radioactive source, or involvement in a vehicle accident. It must be assumed until proven otherwise, that a radioactive source involved in an accident is leaking and will be contaminated, therefore, the overexposure by ionizing radiation and contamination of personnel by radioactive material particles must be avoided or dealt with in an effective manner. Radiological emergencies may occur at any time or place, such as: in shop areas, barracks, highways, or in maneuver areas, therefore, it is inconceivable to establish a plan for every type of radiological emergency that might occur. In general, these instructions will provide guidance in order to react to radiological emergencies effectively and bring the emergency situation under control.

6-2. General Procedures. A radiological emergency, regardless of where or when it occurs, will require immediate actions to be accomplished. Once the incident is recognized as a radiological emergency the following steps will be implemented immediately by personnel at the scene of the emergency, regardless of whether the incident occurs on the installation, highways, or maneuver areas:

- a. The senior NBC NCO/Officer at the scene will take charge and coordinate all efforts to bring the situation under control.
- b. Panic and confusion should be avoided.
- c. Evacuate all personnel from the scene of the accident at least 100 yards in an upwind direction. These personnel should be segregated from other personnel and monitored for possible contamination prior to being released.
- d. Rope or mark off the emergency area to prevent unauthorized entry into the probable radiation area, except for rescue purposes, fire fighting, and other valid reasons.
- e. Contain the radiation hazard by rerouting personnel and traffic, in order to prevent the spread of potential contamination.
- f. Within your means, attempt to extinguish fire, if applicable.

g. Notify authorities, either military or civilian, as the situation may warrant. Request assistance from specialized emergency personnel. You may use the assistance matrix in figure 6-5.

6-3. Emergency Radiation Countermeasures. A radiological emergency may require the expertise of personnel in different fields, such as: police, fire, medical, FLWRSO, or assistance from the local civil authorities. At the scene of the radiological emergency, evaluate the situation and react accordingly in order to save lives, prevent radiation overexposure, or prevent contamination of personnel and equipment. The following countermeasures are normally limited to emergency personnel who react to the request for assistance. Unfortunately, accidents may occur at remote locations and assistance may not be available for hours. Under these circumstances, the individuals or units at the scene of the accident may take immediate action in the following emergency countermeasures, provided, that no one is endangered unnecessarily and that the knowledge, equipment, and other resources are available to deal with ionizing radiation emergencies.

a. Fires.

(1) If a radiological emergency is not immediately present (excessive radiation and contamination), all efforts will be made to extinguish the fire.

(2) A dry chemical, such as carbon dioxide, should be used in order to prevent widespread contamination.

(3) If water is necessary to extinguish the fire, the water should be sprayed as fog in order to prevent the spread of contaminated particles.

(4) If material or the air is suspected of becoming contaminated, rescue workers and fire fighters must wear protective clothing to prevent radioactive particles from contacting the body and respirators worn to prevent the inhalation of these contaminants.

(5) Emergency action personnel will be monitored with an appropriated radiacmeter upon leaving a radiation area.

b. First Aid. Personnel identified as injured and/or contaminated should be evacuated to a physician as soon as possible. First aid may be provided while waiting for evacuation as follows -

(1) Wash wound with clean water.

(2) Allow wound to flow freely for a short period of time.

(3) If mouth, eyes, or nose are contaminated, rinse repeatedly with clean water.

c. Decontamination: After the emergency is contained and under control, decontamination procedures will be initiated as follows:

(1) Contaminated Personnel. Wash with lukewarm water and nonabrasive soap. Cover entire body with lather. Sprinkle soap flakes over the entire contaminated individual. Individual will rub soap flakes on body into a paste. Next rinse entire body with water and remove all traces of soap. Dry body and be monitored. If generally contaminated, the above procedures will be repeated until the levels of contamination are within authorized limits. If the contamination is localized, it may be more practical to cleanse the affected area with swabs rather than to risk the danger of spreading the contaminant. Do not use organic solvents as decontaminates. Contaminated personnel should be evacuated to a medical facility for decontamination as soon as possible, nevertheless, the above procedures may be initiated when medical assistance is unavailable or evacuation of contaminated

personnel is delayed. If extensive contamination exists, obtain assistance/advice from medical personnel before proceeding.

(2) Contaminated Materials and Equipment. Generally, equipment may be decontaminated by washing with soap and water or by cleaning with abrasive material. The person performing the decontamination will:

(a) Wear surgeon's protective gloves when decontaminating equipment.

(b) Repeat above procedures until contamination levels are within NRC License limits.

(c) Discard cleaning materials as radioactive waste. In addition, the drainage of contaminated water into sewer system must be controlled IAW the requirements of Title 10, CFR.

(3) Contaminated Highways and Grounds: If the contamination occurs in these areas, it may be removed by -

(a) Sweeping and shoveling contaminated materials in to a suitable container.

(b) If the contamination is in liquid form, it may be contained by means of dirt, cloth, sawdust, or any other absorbent material.

(c) Monitor affected area and ensure it is within safe levels.

(d) Use appropriate monitoring instruments as required by the circumstances, for example, use the AN/PDR-77 or AN/VDR-2.

(e) Place all contaminated materials and equipment in a plastic bag and remove to an authorized radioactive waste facility.

d. Radiological incidents with "Controlled Items" may require special handling procedures due to their radiation levels and/or toxicity. If this equipment is damaged or burnt in an accident, it must be assumed to be leaking and/or contaminated until proven otherwise.

6-4. Ionizing Radiation Accident Reports. Ionizing radiation accidents will be expeditiously reported as required by AR 385-40.

Chapter 7 STORAGE AND DISPOSAL OF UNWANTED RADIOACTIVE DEVICES AND RAD WASTE

7-1. Unit Level Storage.

a. Army Radioactive Commodities and waste may be stored locally until a sufficient quantity is obtained for turn-in.

b. Radioactive waste, such as: gloves, swipes, and work bench paper will be stored in metal containers with 4-mil plastic liners. All containers will be clearly marked with standard radioactive warning labels, which indicate type of radionuclides present and quantities of each in microcurie or millicurie. Bag will be marked "Radioactive Waste" with radionuclide and quantity.

7-2. Installation and Radioactive Waste Storage Facility.

a. The installation radioactive waste storage annex is under the operational control of the DOL and is located at the DOL Maintenance Area, FLW, duty phone 596-0895.

b. Only the FLWRSO and personnel authorized by the FLWRSO will be allowed into the waste storage room.

c. The storage room door will be clearly marked IAW AR 11-9, 10 CFR, and NRC licenses.

d. The room will be maintained in an extremely clean condition.

e. The storage door will be kept locked at all times, unless in use by authorized personnel.

f. Workers will be briefed on the following -

(1) There will be no eating, drinking, smoking, chewing gum or tobacco, or applying cosmetics in the storage room at any time.

(2) Radioactive waste sources will be handled only long enough to accomplish storage operations.

(3) Workers will be issued and will wear a personal monitoring device if they meet the criteria stated in AR 11-9. The badge will be worn each time they enter the storage room. The badge will be placed between the shoulder and the hip.

(4) Workers will wear surgical gloves when handling any radioactive source in the storage room.

(5) Workers will always wash hands after performing work in the storage room area.

7-3. Turn In of Radioactive Devices.

a. Units will turn in serviceable and unserviceable devices, on a DA Form 2765-1 and DA Form 2407 (Maintenance Request) classification turn in document, to DOL storage and central turn-in supply.

b. DD Form 1348-1A, Release Document is prepared. If item is designated for disposal, it will be temporarily stored at DOL maintenance division radioactive waste storage annex, awaiting consolidation and shipment to a waste site by OSC.

7-4. Turn In of Radioactive Contaminated Waste.

a. Radioactive waste, such as: gloves, filters, swipes, and work bench paper that has accumulated at unit level and has been stored in metal containers will be turned in the following manner:

(1) Make sure container and bags in container are marked and sealed as previously stated.

(2) Write what the waste is, the radionuclide, and the quantity on the form.

b. Dispose of contaminated M43A1 outlet filters IAW TM 3-6665-312-12&P, paragraph 4-13.

7-5. Importance of Prompt Turn In of Items/Material for Disposal.

a. The process of disposing of radioactive materials will be more complex and costly as the responsibility for disposal shifts to individual states. As current disposal facilities are closed and anticipated new sites are delayed, availability of disposal options will be reduced. Costs associated with the development and operation of new sites will be passed on to the generators. The cost per cubic foot for all sites could triple in the near future with constant growth to follow.

b. The AMC recommends that all installations dispose of their current stores of waste radioactive materials prior to calendar year.

c. Disposal of radioactive materials will be coordinated with OSC by the FLWRSO.

Chapter 8 CONTROL OF NON-IONIZING RADIATION SOURCES

8-1. Laser and High Intensity Light Sources.

a. Radiation protection control is required for potentially hazardous sources of optical radiation. The following general list of radiation control elements applies:

(1) SOPs will be published and enforced with copies forwarded to the FLWRSO. These SOPs will specify all radiation safety policies relative to equipment and personnel control to ensure that exposure of personnel is minimized. Under no circumstances should exposure exceed established limits. Sample SOPs follow (see appendix C).

(2) All persons who could be accidentally exposed to potentially hazardous sources of optical radiation will be informed of the radiation hazards and instructed regarding the rules and procedures to be complied with. Instructions will include SOP familiarization or review, proper use of protective equipment and devices, accident reporting procedures, routine checks or surveys prescribed to ensure radiation safety, and procedures for maintaining an operational log for recording radiation safety-related events (safety interlock/warning sign or light overrides, prohibited radiation zone violations, etc.). Radiation safety briefs and instructions should be given annually, and records of instructions will be forwarded to the FLWRSO. These records will include a brief outline of the instructions and list of persons who received the instructions.

(3) All controlled areas will be properly marked, and will have proper warning signs, barricades, lights, alarms, safety switches, etc. See example of warning signs in appendix D.

(4) The FLWRSO, will be notified in the event of an optical radiation source or related safety feature malfunction that could produce radiation levels in excess of the personnel exposure limits.

(5) All alleged overexposure will be reported IAW AR 385-40.

(6) A comprehensive inventory of all sources will be maintained, and an updated copy of this inventory will be forwarded to the FLWRSO. The inventory will be due annually NLT 31 October.

b. Warning Signs for Lasers.

(1) Basis. The appropriate format for warning signs is based upon the hazard classification for the lasers of concern. Further guidance is provided in TB MED 524 to classify a laser.

(2) Warning Signs. Warning signs shall be conspicuously displayed on all entry points or doors to Class 3b and Class 4 laser areas. Warning signs shall use the word "DANGER" and include the type of the laser and the word "VISIBLE" and/or "INVISIBLE", as appropriate, which shall precede the word "RADIATION". The sign shall also contain an appropriate instructional statement, such as: "KNOCK BEFORE ENTERING", or "AUTHORIZED PERSONNEL ONLY - KNOCK AND WAIT". When multiple lasers are present, the types of lasers may be omitted and only a single warning sign is necessary. Additional design specifications for accident prevention signs are contained in American National Standards Institute (ANSI) Z35.1. Warning signs indicating laser use should be displayed only during periods of actual laser use to preclude personnel from developing an attitude that the sign has no meaning, since it is ignored during lengthy periods when lasers are not operated. Examples of laser warnings follow (see appendix D).

c. Warning signs for high intensity lights.

(1) Scope. The format for warning signs for high intensity lights follow. No other guidance currently exists for such sources and some judgement may be required. The general scheme is described below. Warning signs shall provide clear instructions to the operators, maintainer, and potential bystanders.

(2) Warning Signs. Warning signs shall be conspicuously displayed on all entry points or doors to areas containing optical radiation sources which pose either a retinal burn hazard within the normal blink reflex of the eye or pose a significant potential hazard from actinic ultraviolet (UV) radiation such as from some electric arc sources like welding, carbon, mercury and xenon arcs. Few sources emit sufficient radiation to cause chorioretinal burns for momentary exposures. Warning signs shall use the word "DANGER" and shall contain an appropriate instructional statement such as: "KNOCK BEFORE ENTERING" or "AUTHORIZED PERSONNEL ONLY". Signs shall also include the type of source and the word "VISIBLE" and/or "ULTRAVIOLET" and/or "INFRARED", as appropriate, which shall precede the word "EMISSIONS". "DANGER" signs shall be printed upon a white background with a bright red oval around the word "DANGER" and shall contain a red "starburst" and black lettering.

8-2. Radio Frequency Radiation (RFR).

a. Because of the low energy content of RFR radiation, it does not ionize materials and consequently is known as non-ionizing radiation. Absorption of RFR energy generally results in heating of the absorbing medium. If heat gain exceeds compensatory capability, the overall temperature may increase to deleterious levels.

b. Radiation protection control is required for every RFR system that is able to produce power density levels in excess of the permissible exposure limits (PEL). The following general list of radiation control elements applies:

(1) SOPs will be published and enforced with copies forwarded to the FLWRSO. These SOPs will specify all radiation safety policies relative to equipment and personnel control to ensure that exposure of personnel is minimized. Under no circumstances should exposure exceed established limits. Prototype SOP follows at appendix C.

(2) All persons potentially exposed to RFR will be informed of the radiation hazards and instructed regarding the rules and procedures to be complied with. Instructions will include SOP familiarization or review, proper use of protective equipment and devices, accident reporting procedures, routine checks or surveys prescribed to ensure radiation safety, and procedures for maintaining an operational log for recording radiation safety-related events (safety interlock/warning sign or light overrides, prohibited radiation zone violation, etc.).

(3) Radiation safety briefings and instructions will be given annually and records of instructions will be forwarded to the FLWRSO. These records will include a brief outline of the instructions and a list of persons who received the instructions.

(4) All controlled areas will be properly marked and will have proper warning signs, barricades, lights, alarms, safety switches, etc. RFR hazard warning signs are required at all access points to areas in which RFR levels may exceed the PEL. Appropriate information will be inserted on the signs. RFR hazard sign issued under ANSI C95.1, figure D-3 follows.

(5) The FLWRSO, 596-0895/8998 will be notified in the event of an alleged RFR overexposure or related safety feature malfunction that could produce radiation levels in excess of the PEL.

(6) All alleged RFR overexposure will be reported in accordance with the requirements of AR 385-40.

(7) A comprehensive inventory of all RFR sources will be maintained, and an updated copy of this inventory will be forwarded to the FLWRSO. The inventory will be due annually NLT 31 October.

Appendix A
REFERENCES AND FORMS

A-1. Users of this regulation need not read all references listed below in order to understand the contents:

- a. CFR, Title 10 (Energy). Cited in para 1-4b(11)(c), 1-4b(15), 1-4b(23), 1-4c(6), 1-5c, 3-3, 3-3a, 3-3b, 3-3c, 3-5, 6-3c(2)(c), 7-2c
- b. CFR, Title 29 (Labor). Cited in para 1-5c, 3-3, 3-3b, 3-3c.
- c. CFR, Title 39 (Postal Service). Cited in para 1-5c
- d. CFR, Title 49 (Transportation). Cited in para 1-4b(15), 1-4b(24), 1-4c(1), 1-4d(4), 1-5c, 2-1a(8), 2-2a(6), 2-2a(7), 2-2b(1), 2-2c(4), 2-2c(6), 2-2d, 5-3
- e. AR 11-9 (The Army Radiation Safety Program). Cited in para 1-4b(5), 1-4b(23), 1-4b(28), 1-4d(6), 1-4e(2), 1-4e(3)(a), 1-4e(3)(b), 1-4g(3), 1-4h(1), 1-4h(2), 1-5c, 2-1a(1), 2-1a(4), 2-1a(8), 2-3c, 3-3, 3-3b, 3-3c, 3-5, 4-2, 7-2c, 7-2f(3)
- f. AR 25-400-2 (The Modern Army Recordkeeping Systems (MARKS)). Cited in para 1-4b(11)(a).
- g. AR 40-5 (Preventive Medicine). Cited in para 1-4b(5), 1-4b(6), 1-5c
- h. AR 385-40 (Accident Reporting and Records). Cited in para 1-4b(15), 6-4, 8-1a(5), 8-2b(6)
- i. AR 710-3 (Asset and Transaction Reporting System). Cited in para 1-4g(6), 2-4a, 2-4b(2), 2-4d(1)(b), 2-4d(3)
- j. DA PAM 40-18 (Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation). Cited in para 1-4e(3)(a).
- k. TB 43-0116 (Identification of Radioactive Items in the Army). Cited in para 5-5b(3)(b)
- l. TB 43-180 (Calibration and Repair Requirements for the Maintenance of Army Material). Cited in para 2-3e.
- m. TB MED 521 (Occupational and Environmental Health: Management and Control of Diagnostic X-Ray, Therapeutic and Medical Research X-Ray, systems and facilities). Cited in para 1-5c.
- n. TB MED 523 (Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultra Sound). Cited in para 1-4b(11)(d), 1-4e(3)(b) and 1-5c.
- o. TB MED 524 (Occupational and Environmental Health: Control of Hazards to Health from Laser Radiation). Cited in para 8-1b(1)
- p. TM 3-6665-312-30&P (Intermediate Direct Support Maintenance Manual for M8A1 Automatic Chemical Agent Alarm Consisting of M43A1 Chemical Agent Alarm Detector Unit, M42 Chemical Alarm Unit and Auxiliary Equipment M10A1 Power Supply). Cited in para 2-4d(1).
- q. TM 3-6665-312-12&P (Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List for M8A1 Automatic Chemical Agent Alarm and Auxiliary Equipment M10 Power Supply, M10A1 Power Supply, M228 High Profile Mounting Kit and M182 Low Profile Mounting Kit). Cited in para 2-4d(1) and 7-4b.

r. TM 3-6665-331-23&P (Unit and Direct Support Maintenance Manual for Chemical Agent Monitor). Cited in para 2-4d(1).

s. NRC Regulatory Guide 8.13. Cited in paras 4-3c and 4-4.

t. ANSI C95.1 (Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz). Cited in para 8-2b(4).

u. ANSI Z35.1 (Accident Prevention Signs). Cited in para 8-1b(2).

A-2. Section II. Prescribed forms.

a. FLW Form 846-R, Radiation Material Movement Form (Maneuver Only). Prescribed in para 2-2c(3), 5-4e, 5-4f, 5-4g, 5-5b, 5-5b(2), 5-5b(4)(a), 5-5b(4)(b), 5-5b(5), 5-5b(6) and 5-5b(7)

b. FLW Form 851-R, Radioactive Material Movement Form. Prescribed in para 1-4b(24), 1-4b(25), 1-4c(2), 1-4d(3), 1-4d(4), 2-2a(3) and 2-2c(3).

A-4. Section III. Referenced Forms.

a. DA Form 2407, Maintenance Request.

b. DA Form 2765-1, Request for Issue or Turn-In.

c. DD Form 836, Dangerous Good Shipping Paper/Declaration and Emergency Response Information of Hazardous Materials Transported by Government Vehicles/ Containers/Vessels.

e. DD Form 1348-1A, Issue Release/Receipt Document.

Appendix B
FIGURES

IONIZING RADIATION SOURCES

The following items are radiation sources, which are controlled, dangerous and require specific usage and handling safety precautions, warning signs if applicable, and storage limitations.

a. Individually Controlled Items:

- (1) 6635-00-030-6896 Tester, Density, Moisture Nuclear (MC1)
- (2) 6665-00-856-8235 Radioactive Source Set, M3A1
- (3) 6665-00-556-8825 Radiac Calibrator Set, AN/UDM-1A
- (4) 6665-00-179-9037 Radiac Calibrator, AN/UDM-2
- (5) 6665-00-767-7497 Radiac Calibrator, AN/UDM-6
- (6) 6665-00-973-1123 Radiac Calibrator, TS-1230A
- (7) Radiac Calibrator Unit JLS-81-10

b. Controlled Items:

- (1) 6665-00-526-8648 Source, AN/PDR-39
- (2) 6665-00-832-6159 Source, MK-7338
- (3) 6665-01-081-8140 Chemical Agent Dectector, M43A1
- (4) 6665-01-199-4153 Chemical Agent Monitor
- (5) 6665-01-357-8502 Improved Chemical Agent Monitor
- (6) 6665-01-438-3673 Automatic Chemical Agent Detector, M88

Figure B-1. Ionizing Radiation Sources.

1. Purpose: The following information is required by Title 49 CFR 172.203(d) for the movement of the AN/UDM-2 RADIAC calibrator by military vehicle. FLW Form 851-R must be maintained in operator's compartment of vehicle.) The following is required information to complete FLW Form 851-R.

- a. Radioactive Material, Special Form n.o.s.
- b. Identification Number UN 2974
- c. Strontium-Yttrium 90
- d. Special Form
- e. 180 millicurie
- f. RADIOACTIVE-YELLOW II (SF 414)
- g. Transport index 0.2
- h. Certification and supporting safety analysis for special form source, AN/UDM-2 RADIAC calibrator, is maintained by the U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-RER, Fort Monmouth, NJ 07703-5000, commercial phone (732) 427-3112, ext. 6440 or DSN 987-3112/4427.
- i. Certification and supporting safety analysis for specification 7A packaging Type A container for AN/UDM-2 RADIAC calibrator is maintained by the U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-RER, Fort Monmouth, NJ 07703-5000, commercial phone (732) 427-3112/4427 or DSN 987-3112/4427.
- j. NRC license number 29-01022-08
- k. Device Weight - 30 pounds

2. Additional Requirement:

- a. Vehicle placarding not required.
- b. RADIAC calibrator must be secured to prevent shifting or movement during transport.
- c. RADIAC calibrator will be secured within the transport vehicle to provide security measures adequate to prevent unauthorized removal.
- d. In the event of a major accident, the following personnel will be notified:
 - (1) SDO, Fort Leonard Wood, MO, commercial phone (573) 593-6126 or DSN 581-6126.
 - (2) RSO, U.S. Army Communications-Electronics Command (CECOM), commercial phone (732) 427-3112/4427. DSN 987-3112/4427.

Figure B-2. Transportation by Military Vehicle.

1. Purpose: The following information is required by Title 49 CFR 172.200-202 and 172.203(d) for the movement of the AN/UDM-6 RADIAC calibrator by military vehicle. FLW Form 851-R must be maintained in operator's compartment of vehicle. The following is required information to complete FLW Form 851-R.

- a. Consignee and consignor's name
- b. Shipping Notice - "This package conforms to the conditions and limitations specified in Title 49 CFR 173.421 for excepted radioactive material, limited quantity, n.o.s., un 2910."
- c. Radioactive Material, Limited Quantity n.o.s.
- d. Identification Number UN 2910
- e. Plutonium 239
- f. Normal Form-solid, Elemental Plutonium (metal)
- g. 1.4 microcurie
- h. Fissile Exempt
- i. Excepted from specification packaging, marking, and labeling
- j. Possession and use of the above radioactive device is authorized under NRC License # SNM-1900.
- k. 14 3/16 inches x 10 5/8 inches x 1 13/16 inches, 8 lbs.

2. Additional Requirement:

- a. Vehicle placarding not required.
- b. RADIAC calibrator will be secured within the transport vehicle to provide security measures adequate to prevent unauthorized removal.
- c. RADIAC calibrator must be secured to prevent shifting or movement during transport.
- d. In the event of a major accident, the following personnel will be notified:
 - (1) SDO, Fort Leonard Wood, MO, commercial phone (573) 593-6126 or DSN 581-6126.
 - (2) RSO, U.S. Army CECOM, commercial phone (732) 427-3112/4427, DSN 987-3112/4427.
- e. This document is applicable only for a single AN/UMD-6 Radiac Calibrator.

Figure B-3. Transportation by Military Vehicle.

RADIOACTIVE MATERIAL MOVEMENT				
Proponent - DOL: Prescribing Directive - FLW Reg 11-1				
<input type="checkbox"/> SHIPMENT		<input type="checkbox"/> RECEIPT		
TCN/GBL:	NO. CONTAINERS:	QUANTITY:		
FROM:		TO:		
DOT HAZARD CLASS 7				
<input type="checkbox"/> Radioactive Material, N.O.S <input type="checkbox"/> Radioactive Material, Special Form, N.O.S. UN 2974 <input type="checkbox"/> Radioactive Material, LSA, N.O.S. UN 2912		<input type="checkbox"/> Radioactive Material Excepted Package Instruments and Articles, UN 2910 <input type="checkbox"/> Radioactive Material Excepted Package Limited Quantity, UN 2910 <input type="checkbox"/> Other:		
NSN	NOMENCLATURE	PHYSICAL FORM	RADIONUCLIDE CATEGORY	TOTAL ACTIVITY
			<input type="checkbox"/> A1 <input type="checkbox"/> A2	
			<input type="checkbox"/> A1 <input type="checkbox"/> A2	
			<input type="checkbox"/> A1 <input type="checkbox"/> A2	
Instrument Used:				
Calibration Due:		SN:	Transportation Index:	
Radiation Level Surface :	mrem/hr	One Meter:	mrem/hr	Background: mrem/hr
Surface Contamination Less Than		DPM/cm ²		
<input type="checkbox"/> No DOT Label Required		<input type="checkbox"/> Two Each DOT YELLOW Label Required		<input type="checkbox"/> Radioactive Materials Placard Required
<input type="checkbox"/> This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of radioactive material, UN 2910.				
<input type="checkbox"/> This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package-instruments or articles, UN 2910.				
IN CASE OF EMERGENCY CONTACT THE FLWRSO AT (573) 596-0895 OR THE NEAREST MILITARY INSTALLATION				
This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in the proper condition for transportation according to the applicable regulations of the Department of Transportation.				
FLWRSO/ALT FLWRSO NAME:		FLWRSO/ALT FLWRSO SIGNATURE:		DATE:
TRANSPORTATION OFFICER:		TRANSPORTATION OFFICER'S SIGNATURE:		DATE:

FLW Form 851 (Rev Dec 02) Previous Edition Obsolete

Figure B-4. Sample of FLW Form 851-R.

RADIOACTIVE MATERIAL MOVEMENT FORM (MANEUVERS ONLY)				
Proponent - DOL; Prescribing Directive - FLW Reg 11-1				
ATTN: Fort Leonard Wood Radiation Safety Officer (FLWRSO)		DATE:		
		SHIPMENT NUMBER:		
<p>1. Reference: Appendix E, Movement of Military Equipment Containing Radioactive Materials (Maneuvers Only) Instructions.</p> <p>2. This unit has complied with all of the requirements of the above references. In case of an accident/fire with radioactive equipment, the FLWRSO will be contracted prior to releasing information. See above reference for location and telephone numbers of FLWRSO.</p> <p>3. Administrative Information:</p> <ul style="list-style-type: none"> a. Unit Identification: b. Purpose of Movement: c. Date of Deployment: d. Destruction: e. Date of Return: <p>4. The following unit's Radiation Safety Personnel are familiar with the types of radioactive materials, associated hazards, and emergency procedures to be implemented in case of an accident/fire with equipment containing radioactive materials. A visual inspection has been accomplished to ensure the removal of damaged or leaking radioactive equipment and for proper storage of equipment to prevent further damage:</p>				
	Name	Date		
a. Prior to Departure:				
b. Prior to Return:				
5. Inventory of equipment containing radioactive materials: <i>(If required, continue on reverse side.)</i>				
NOUN	NSN	RADIONUCLIDE	ACTIVITY	QTY
6. I understand that this shipment may be inspected by the FLWRSO, Transportation Officer, or other authorized representatives for compliance with above reference. Also, that this form is my authority to transport radioactive materials/equipment on public highways for the purpose of conducting official training exercises.				
Unit Commander:		Signature:		Date:

FLW Form 846 (Rev Dec 02) Previous Edition Obsolete

Figure B-5. Sample of FLW Form 846-R (Radioactive Material Movement Form (Maneuver Only)).

Phone Roster for Agencies/Individuals on Fort Leonard Wood

Radiological accidents may require the assistance of various agencies in order to effectively contain the emergency. The following Matrix will be used to contact these agencies/ individuals in order to obtain assistance:

- a. Local Commander, NBC Officer, NBC NCO
- b. Installation SDO, FLW (573) 563-6126 DSN 581-6126
- c. Military Police, FLW (573) 596-6141 DSN 581-6141
- d. Fire Department, FLW 911
- e. Ambulance, FLW (573) 596-2155
- f. Fort Leonard Wood RSO (573) 596-0151/0895
- g. Health Services RSO, FLW (573) 596-0449
- h. 763rd EOD, FLW (573) 596-2818
- i. MANSCEN Safety Office (573) 596-0116
- j. Directorate of Environmental (573) 596-0869
- k. Civilian Authorities Consult the Local Telephone Directory

Figure B-6. Phone Roster for Assistance in Radiological Accidents.

Appendix C
SAMPLE SAFETY STANDING OPERATING PROCEDURES (SOPs)

Office Symbol (MARKS No)	Date of SOP
MEMORANDUM FOR XXXXXXXXXXXXXXXX	
SUBJECT: Standing Operating Procedure for Training with Portable Fire Control Laser	
<p>1. Laser rangefinders and designators can cause irreparable blindness if used improperly. Exposure of the eye to either the direct beam or a beam reflected from a flat mirror-like surface can cause an injury at a great distance. The following control measures will prevent such an exposure when training operators with portable fire control lasers in one-sided exercises:</p>	
<p>a. Laser operators shall periodically read and always follow this safety SOP.</p>	
<p>b. Never point the laser at any unprotected personnel or flat mirror-like surfaces such as glass.</p>	
<p>c. Operate only on laser-approved ranges established in accordance with AR 385-63.</p>	
<p>d. The laser will not be operated or experimented with outside the range area unless it is specifically authorized. The laser exit port will be covered by an opaque dust cover and the laser disabled by removal of the battery when the laser is located outside the area.</p>	
<p>e. Positively identify the target and buffer areas prior to laser operations.</p>	
<p>f. Laser eye protection is not required for laser operators even when viewing the target area with binoculars. However, operators should never wander into the laser target area without appropriate laser eye protection. Such eye protection shall have curved lenses.</p>	
<p>g. No special precautions are necessary for firing during rain, fog, or snow fall. Certain ranges may be closed for operation if water begins pounding either on the ground or on snow.</p>	
<p>h. Report immediately to your supervisor any suspected injury or defective equipment (such as misalignment of the laser beam with the point telescope) so that appropriate action may be taken.</p>	
<p>POC for this action is SFC John Doe, 596-####.</p>	
<p>Unit Commander's Signature</p>	

Figure C-1. Sample Safety SOP for Training with Portable Fire Control Lasers.

Office Symbol (MARKS No)	Date of SOP
MEMORANDUM FOR XXXXXXXXXXXXXXXX	
SUBJECT: SOP for Maintenance Shop Operations of Fire Control Laser	
<p>1. Laser rangefinders and designators can cause irreparable blindness if used improperly. Exposure of the eye to either the direct beam or a beam reflected from a flat mirror-like surface can cause an injury to the unprotected eye. Class 4 lasers may also pose a potential hazard when viewing a diffuse reflection of the beam and may also pose a skin hazard. The following control measures will prevent hazardous exposure during laser operations in the maintenance shop:</p> <ul style="list-style-type: none">a. Maintenance personnel shall periodically read and shall always follow this safety SOP.b. Only those operations authorized in appropriate maintenance manuals shall be permitted.c. Never direct the laser at unprotected personnel.d. Wear laser protective eyewear whenever the laser is operated with an unenclosed beam and then use a countdown procedure.e. Operate the laser from within an approved area which is closed such that no lines-of-sight exist to unprotected personnel outside the area. The laser exit port will be covered by an opaque dust cover and the battery will be removed from the device when it is located outside of the closed area unless it is specifically authorized.f. Prior to laser operations, complete the following checklist:<ul style="list-style-type: none">(1) Periodically test door electrical interlock switch at entrances.(2) Select appropriate laser protective eyewear for the laser(s) to be operated. Ensure that eye protection is marked with its protective characteristics.(3) Test warning lights or alarms to the closed area.(4) Post a warning sign at entrances to the closed area.(5) Ensure that any other required safety devices are available.g. A lens used to focus the laser beam of Class 3 and Class 4 lasers will increase the eye hazards from diffuse reflections and the skin hazards around the focal point. No optical devices will be allowed in the maintenance area.h. Report immediately to your supervisor any suspected injury or defective equipment so that appropriate action may be taken.	
2. POC for this action is SFC John Doe, 596-####.	
Unit Commander's Signature	

Figure C-2. Sample Safety SOP for Maintenance Shop Operations of Fire Control Lasers.

Office Symbol (MARKS No)

Date of SOP

MEMORANDUM FOR XXXXXXXXXXXXXXXX

SUBJECT: Safety SOP for ARC Welding and Cutting Operations

1. Welding, cutting, and allied operations may produce radiant energy (radiation) harmful to health. You should acquaint yourself with the effects of this radiant energy. Radiant energy may be ionizing (such as X-rays) or non-ionizing (such as ultraviolet, visible light, or infrared). Radiation can produce a variety of effects such as serious and painful ultraviolet induced eye and skin irritation or possible blindness, depending on the radiant energy's wavelength and intensity, if excessive exposure occurs. The intensity and wavelengths of non-ionizing radiant energy produced depend on many factors, such as the process, welding parameters, electrode and base metal composition, fluxes, and any coating or plating on the base material. Some processes such as resistance welding and cold pressure welding ordinarily produce negligible quantities of radiant energy. However, most electric arc welding and cutting processes (except submerged arc when used properly, laser welding and torch welding, cutting, brazing, or soldering) can produce quantities of non-ionizing radiation such that precautionary measures are necessary.

2. Protection from possible harmful effects caused by non-ionizing radiant energy from welding include the following measures:

a. Do not look at welding arcs except through welding filter plated, which meet the requirements of American National Standards Institute (ANSI) Standard Z87.1-1979, Practice for Occupational and Education Eye and Face Protection, published by ANSI, 1430 Broadway, New York, New York 10018. NOTE: Transparent welding curtains are not intended as welding filter plates, but rather are intended to protect passersby from incidental exposure.

b. Protect exposed skin with adequate gloves and clothing as specified in ANSI Standard Z49.1.

c. Beware of reflections from welding arcs, and protect all persons from intense reflections. NOTE: Paints using pigments of substantially zinc oxide or titanium dioxide have a low reflectance of ultraviolet radiation.

d. Avoid exposing passersby to welding operations by use of screens, curtains, or adequate distance from aisles, walkways, etc.

e. Safety glasses with UV protective side shields have been shown to provide some beneficial protection from ultraviolet radiation produced by welding arcs.

3. POC for this action is SFC John Doe, 596-####.

Unit Commander's Signature

Figure C-3. Sample Safety SOP for ARC Welding and Cutting Operations.

Office Symbol (MARKS No)	Date of SOP
MEMORANDUM FOR XXXXXXXXXXXXXXXX	
SUBJECT: SOP for Photographic ARC Sources	
1. Serious and painful ultraviolet induced eye and skin irritation may result to unprotected personnel if the unit is improperly used. The following precautions reduce needless occupational exposure:	
a. Only authorized personnel familiar with the potential hazards and control measures shall use the unit.	
b. The unit shall be used in a designated area with limited access whenever possible in order to provide added protection to passersby. Operation from within a closed, well ventilated room or draped area is most desirable to reduce the risk of exposure.	
c. Frequent exposure to direct and leakage light or light scattered within the work environment should be avoided since the potential hazard accumulates with each exposure during a workday. When possible, the source should be shielded from the operator to limit the dose.	
d. When exposure is necessary, operators should take appropriate protective measures, such as use of dark glasses with side shields, long-sleeved shirts, gloves, and long pants. Although such protective clothing and equipment may not completely eliminate the ultraviolet radiation to covered portions of the body, it lessens risk of injury to the skin or eye.	
e. Never look directly at the source. A welder's shield of shade 11 is adequate to view the source comfortably when necessary.	
2. POC for this action is SFC John Doe, 596-####.	
Unit Commander's Signature	

Figure C-4. Sample SOP for Photographic ARC Sources.

Office Symbol (MARKS No)	Date of SOP
MEMORANDUM FOR XXXXXXXXXXXXXXXXX	
SUBJECT: SOP for Ultraviolet ARC Sources	
<p>1. Serious and painful ultraviolet induced eye and skin irritation may result to unprotected personnel if the unit is improperly used. The following precautions reduce needless occupational exposure:</p> <ul style="list-style-type: none">a. Only authorized personnel familiar with the potential hazards and control measures shall use the unit.b. The unit shall be used in a designated area with limited access whenever possible in order to provide added protection to passersby. Operation from within a closed, well ventilated room or draped area is most desirable to reduce the risk of exposure.c. Frequency exposure to direct and leakage light or light scattered within the work environment should be avoided since the potential hazard accumulates with each exposure during a workday. When possible, the source should be shielded from the operator to limit the dose.d. When exposure is necessary, operators should take appropriate protective measures such as: use of glasses with side shields, long sleeved shirts, gloves, and long pants. Although such protective clothing and equipment may not completely eliminate the ultraviolet radiation to covered portion of the body, it lessens the risk of injury to the skin or eye.e. Never look directly at the source without protective eyewear.	
<p>2. POC for this action is SFC John Doe, 596-####.</p>	
<p>Unit Commander's Signature</p>	

Figure C-5. Sample SOP for Ultraviolet ARC Sources.

Office Symbol (MARKS No)	Date of SOP
MEMORANDUM FOR XXXXXXXXXXXXXXXX	
SUBJECT: SOP for Radio Frequency Radiating Source Operating/Maintaining	
<p>1. SOPs provide a mechanism for radiation protection and training of personnel relative to RFR sources. The purpose of the SOP is to prevent personnel overexposure to RFR, and for this reason an SOP is required for any system that is able to produce RFR power density levels in excess of the Permissible Exposure Limit (PEL) (see Note 1). The first principle to be followed in establishing SOPs is to prevent any possible RFR in areas that are potentially occupied by personnel. If that cannot be done without compromise of the mission, then the irradiated area must be controlled wherever the RFR exceeds the PEL. Positive control methods are preferred (physical barricades, visual surveillance, warning signs, lights, etc., depending upon the level of radiation involved (see note 2)). If these means are not feasible then the potentially exposed personnel must be carefully trained in the procedures that will prevent overexposure. In addition, the training must be reinforced periodically (documented annual periodic training is required by regulation). The published SOPs document each of the control processes—equipment, radiation zone, and personnel. The following list of procedures is minimal. Each organization should expand this list to meet the particular needs of the activity and RFR inventory.</p> <ul style="list-style-type: none"> a. Prohibit unnecessary free-space radiation of all controlled systems. This should apply absolutely inside of buildings. The use of dummy loads or test sets is recommended wherever possible, and isolated antennas (roof/tower mounted) should be specified wherever free-space radiation is required. b. Post the standard RFR warning sign along all access routes into radiation zones where power density levels can exceed the PEL. Barricades (rope/fence) and/or warning light/alarms may be necessary to isolate any radiation zone where the power density can exceed five times the PEL. Post the standard RFR warning sign (Figure H-9) along such barricades to warn personnel of the overexposure potential. c. Post the standard RFR warning sign permanently in any work area where controlled sources are regularly operated. The warning message should inform personnel that RFR sources are operated in the area. The requirement is optional in those work areas where free space radiation is not normally permitted. d. Observe the RFR warning messages in TMs, FMs, TBs, etc., during all operations. Wherever special RFR related warnings/procedures are necessary, publish these and post them at the work station. e. Test all RFR related safety interlocks/switches/warning devices, etc., prior to any operation that utilizes these safety features for radiation protection. Maintain a log of the results of all such tests. f. Provide initial and periodic (annual as a minimum) RFR safety briefings for all personnel required to work with controlled sources. A permanent record should be made of the content of these briefings and the attendance roster. Provide both to FLWRSO. g. Report all instances of suspected or actual overexposure. Note that all overexposure must be investigated and documented. Investigations involving levels of five times the PEL must include measurement of exposure levels, appropriate medical examination, and a detailed description of circumstances surrounding the incident. h. Post the SOP conspicuously, as a minimum in the work place. i. Forward a copy of the SOPs, and subsequent changes thereto, to the FLWRPO. j. Direct concerns relative to the safety of RFR activity within the organization to the FLWRSO for technical support consultation and exposure control. k. Retain a record of exposure criteria for RFR sources operated by the organization. l. Compile and maintain an inventory of RFR sources operated by the organization. Provide this list to the FLWRSO, with updates as the inventory changes. <p>Point of clarification.</p> <ul style="list-style-type: none"> a. The inventory of RFR sources maintained by the FLWRSO lists all installation sources that can exceed the PEL. b. A system that is able to produce RFR power density levels greater than five times the PEL requires more rigid radiation protection control than one that produces less than five times the PEL. <p>2. POC for this action is SFC John Doe, 596-####.</p>	
Unit Commander's Signature	

Figure C-6. Prototype SOP for Radio Frequency Radiating Source Operating/Maintaining.

Appendix D
Warning Signs

Figure Number	Title	Page
*Figure D-1	Entrance Sign for Electric Arc Welding Areas and Open Arc Platemaker Areas.	25
*Figure D-2	Entrance Sign for Foundry Arc Areas.	25
*Figure D-3	Entrance Sign for Search Light Maintenance Areas.	26
Figure D-4	Example of Class 3b Laser Facilities Warning Sign.	26
Figure D-5	Example of Class 4 Laser Facilities Warning Sign.	26

*Examples of Area Warning Signs for Optical Radiation Sources which Pose Either a Retinal Burn Hazard Within the Normal Blink of the Eye or Pose a Significant Potential Hazard from Actinic UV Radiation.

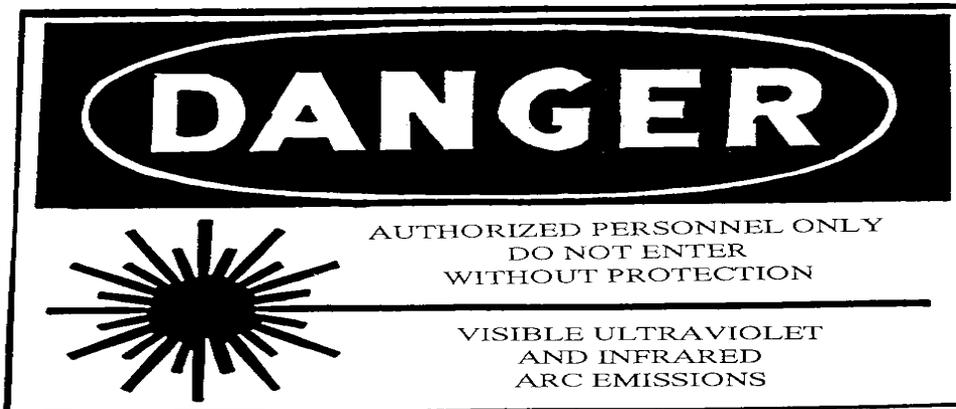


Figure D-1. Entrance Sign for Electric Arc Welding Areas and Open Arc Platemaker Areas



Figure D-2. Entrance Sign for Foundry Arc Areas.



Figure D-3. Entrance Sign for Searchlight Maintenance Areas.

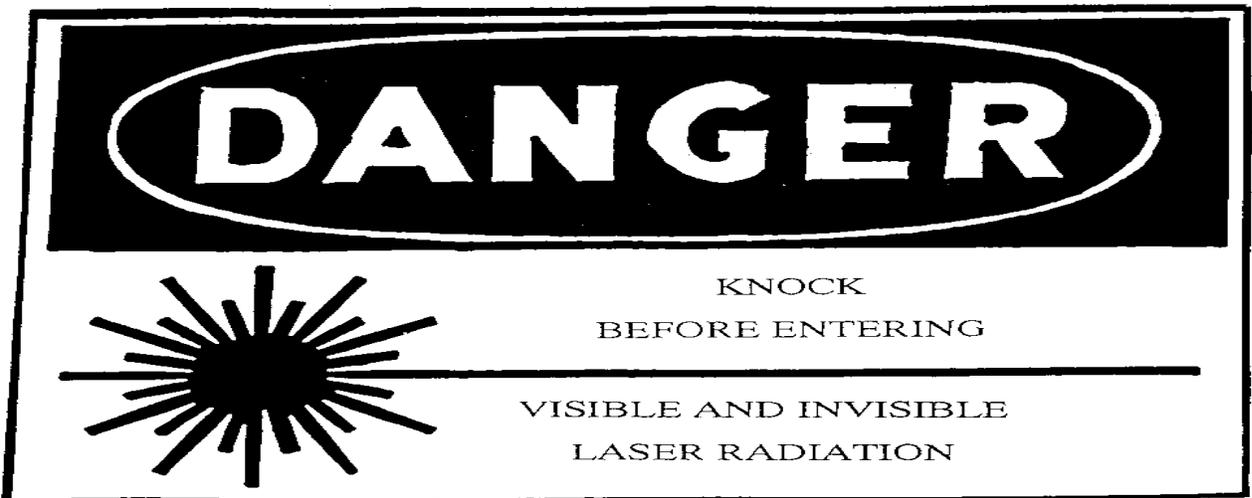


Figure D-4. Example of Class 3b Laser Facilities Warning Sign.

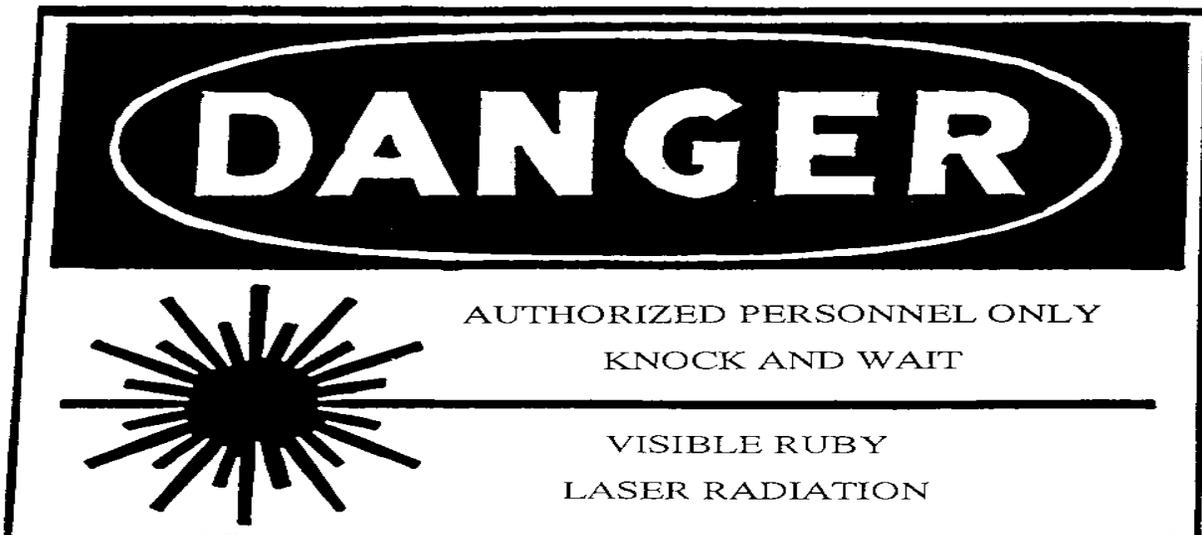


Figure D-5. Example of Class 4 Laser Facilities Warning Sign.

Glossary

ACADA Alarm chemical agent detector automatic	GBL Government bills of lading	PBO property book officers
ADR Automated dosimetry records	HQ Headquarters	PEL permissible exposure limits
ALARA as low as is reasonably achievable	HR hour	POC point of contact
AMC Army Major Command	IAW in accordance with	RADIAC radiation, detection, indication, and computation.
AMDF Army master data file	ICAM improved chemical agent monitor	RATTS radiation testing and tracking system
ANSI American National Standards Institute	ICS individually controlled sources	REM roentgen equivalent mammal
AR Army Regulation	LRSO alternate radiation safety officer	RF radio frequency
ATTN attention	MANSCEN & FLW United States Army Maneuver Support Center and Fort Leonard Wood (same as MANSCEN)	RFR radio frequency radiation
CAM chemical agent monitor	MARKS Modern Army Recordkeeping Systems	RSO radiation safety officer
Cdr Commander	MED medical	RSP radiation safety program
CECOM Communications-Electronics Command	MEDDAC United States Army Medical Department Activity	SCIC special control item code
CFR Code of Federal Regulations	MILLIREM milliroentgen equivalent man	SDO staff duty officer
DA Department of the Army	MR meter reading	SOHAC Safety and Occupational Health Advisory Council
DD Department of Defense	MSC Major Subordinate Command	SOP standard operating procedure
DECAM Directorate of Environmental Compliance and Management	NBC nuclear biological chemical	TB technical bulletin
DOC Directorate of Contracting	NCO noncommissioned officer	TM technical manual
DOD Department of Defense	NICP National Inventory Control Point	TMDE technical measurement diagnostic equipment
DOL Directorate of Logistics	NLT no later than	TRADOC United States Army Training and Doctrine Command
DOT Department of Transportation	NRC Nuclear Regulatory Commission	TSC Training Support Center
DPW Directorate of Public Works	NRP non-ionizing radiation program	UV ultraviolet
EOD Explosive Ordnance Detachment	NSN national stock number	
FLW Fort Leonard Wood	OSC operation support command	
FLWRSO Fort Leonard Wood Radiological Safety Officer		