Army Pamphlet 700-XX

Logistics

Handling Procedures for Equipment Contaminated with Depleted Uranium or Radioactive Commodities

Headquarters,
Department of the Army
Washington, DC
XX XXX 199X

UNCLASSIFIED

SUMMARY OF CHANGE

This new pamphlet--
Establishes formal procedures for handling equipment that has been determined to be contaminated with depleted uranium or other radioactive commodities.

Delineates actions as a result of combat and non-combat situations (Chapter 2).

Prescribes guidance for conducting surveys and decontamination of Army fielded radioactive commodities (Chapter 5).

Prescribes guidance for handling foreign equipment that may be contaminated (Chapter 6).

Describes the functions of the Army Contaminated Equipment Retrograde Team (ACERT).

Logistics

Handling Procedures For Equipment Contaminated With Depleted Uranium Or Radioactive Commodities

History. This printing publishes a new Department of the Army Pamphlet.

Summary. This pamphlet prescribes handling procedures for equipment contaminated with DU and/or other low level radioactive materials. The policies and procedures regarding the management of contaminated equipment are prescribed in AR 700-xx.

Applicability. This pamphlet applies to Department of the Army (DA) commands, installations, and activities. This includes the U.S. Army Reserve (USAR) and the Army National Guard of the United States (ARNGUS). This pamphlet remains applicable to DA personnel deployed to either humanitarian or peacekeeping missions where the degree of readiness to respond to hostile fire requires the availability of radioactive commodities, such as depleted uranium ammunition, as a contingency.

Proponent and Exception Authority. The proponent of this DA pamphlet is the HQDA Office of the Deputy Chief of Staff for Logistics (ODCSLOG). The ODCSLOG has authority to approve exceptions to this pamphlet that are consistent with controlling law and regulation. Proponents may delegate this approval authority, in writing, to a division chief under their supervision within the proponent agency who holds the grade of colonel or civilian equivalent.

Interim Changes. Interim changes to this pamphlet are not official unless they are authenticated by the Administrative Assistant to the Secretary of the Army. Users will destroy interim changes on their expiration date unless sooner superseded or rescinded.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Headquarters, Department of the Army (HQDA) (DALO-SMR), Washington DC 20130-0500.

Distribution. Distribution of this publication is made in accordance with DA Form 12-09-E, block 5428, intended for command level B for Active Army, Army Reserve, and Army National Guard.

Contents (Listed by paragraph number)

Chapter 1
Introduction

1-1. Purpose
This pamphlet provides specific guidance on the handling of U.S. and foreign equipment that may have been contaminated with radioactive materials as a result of DU munitions/armor or damaged radioactive commodities.

1-2. References
Required and related publications and prescribed and referenced forms are listed in appendix A.

1-3. Explanation of abbreviations and terms
Abbreviations and special terms used in this pamphlet are explained in the glossary.

1-4. Deviations
a. Limit deviations to those from Army standards and procedures. Deviations from Federal and DOD regulations and standards are not authorized.
b. The following personnel may authorize deviations from Army standards and procedures.
(1) Each MACOM commanding general.
(2) The Superintendent, U.S. Military Academy.
(3) The Chief, National Guard Bureau (NGB). (The Chief, NGB may sub-delegate deviation authority to the State Adjutant Generals.)
c. Only personnel listed in para b may approve residual risk levels deemed to be too high or extremely high. Authority to accept residual risk will be IAW FM 101-5. For the purpose of this regulation, the personnel listed in para b are considered MACOM commanding generals.
d. Grant deviations for one year or less. The respective approval authority may approve deviation renewals provided conditions cited in the original deviation remain the same.
e. Any accident or mishap occurring under an approved deviation will cause automatic termination of the approval until the respective approving authority completes an investigation and revalidates the deviation.

1-5. Policy
Damaged and undamaged RCE requiring retrograde will be processed consistent with a commander's assessment of conditions and risks, in such a manner as to maximize individual safety and maintain radiation exposure to As Low As Is Reasonably Achievable (ALARA) levels.

1-6. Summary for Commanders.
a. In peacetime, comply with the Nuclear Regulation Commission (NRC) license requirements and all applicable federal, state, Army, and host nation laws (including status of forces (SOFA) agreements), regulations, and policies regarding radioactive materials and contaminated equipment.
b. The Commander for the deployment/operation will assume responsibility for risk management based upon the Commander-in-Chief's (CINC's) assessment of the risks posed by the operation and the guidance and policies in this regulation.
c. Exceptions from peacetime procedures are granted by ODCSLOG and only allowed when operational risks demand modification. Even in combat, there are areas in the theater of operations (e.g. major support facilities in

the rear area) where personnel risks are comparable to those found in peacetime. At these locations, all peacetime precautions and procedures will be followed.
d. Emergency medical considerations outweigh radiological contamination concerns. The health and safety of the individual is the primary concern. The condition of injured personnel should be assessed and stabilized prior to considering any decontamination operations.
e. In general, commanders at all levels should take prudent measures to keep radiation exposures to all personnel as low as is reasonably achievable that are consistent with the operational risks. Commanders will ensure that personnel who handle radioactive materials or come in contact with RCE will receive adequate training as specified in Section 2-3, AR 700-xx, and be trained in the contents of this Pamphlet.

Chapter 2
Essential Concepts

2-1. General

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d. Emergency medical considerations outweigh radiological contamination concerns. The health and safety of the individual is the primary concern. The condition of injured personnel should be assessed and stabilized prior to considering any decontamination operations.
e. In general, commanders at all levels should take prudent measures to keep radiation exposures to all personnel as low as is reasonably achievable (ALARA) that are consistent with the operational risks.
f. The risk management process per FM 101-5 will be utilized by commanders throughout the entire retrograde process to ensure that the needs for mission accomplishment, protection of personnel, and proper handling of the contaminated equipment are balanced. This should include:
(1) Health Risk Assessments to the degree applicable to the operational environment.

(2) Safety Risk Assessments in conjunction with Mission, Enemy, Terrain, Troops, Time, Civilian Considerations (METT-TC).
(3) Guidance in this pamphlet and AR 700-xx.

2-2. Combat Situations.
Process RCE IAW existing federal and Army guidelines. Additionally, follow the general guidelines listed below.
a. Phase I - IMMINENT THREAT. Imminent Threat includes combat and incidents like fires, spills, or accidental releases involving radioactive materials and mixed waste.
(1) The commander will include operational exposure guidance into all phases of the RCE handling operations using the appropriate operational exposure guidance (see ACE Directive 80-63, FM 3-3-1, Joint Pub 3-11, and TB 9-1300-278).
(2) Vehicles radiologically contaminated from RCE that are otherwise mission ready should be used in an imminent threat situation.
(3) It is critical that radiological contamination incidents or RCE is reported as soon as possible after the situation stabilizes (especially to Battle Damage, Assessment and Repair (BDAR) organizations) to facilitate proper follow up.
b. Phase II - RECOVERY. Recovery includes battlefield damage assessment and repair.
(1) RCE should be recovered separately from non-contaminated material.
(2) All material suspected of being radiologically contaminated will be treated as RCE until such a time as it is identified as clean. Work equipment will not be removed prior to a radiological survey.
(3) Caution should be exercised by recovery personnel while handling damaged material because of unexploded ordnance or contamination.

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Damaged or destroyed Abrams series Tanks, Bradley Fighting Vehicles, and other vehicles may contain unexploded or unstable ordnance. This ordnance, which may or may not retain its normal shape, may explode upon contact or movement. Only explosive trained personnel will move or handle unexploded and damaged munitions. If material is a catastrophic loss and an inspection indicates the presence of unexploded ordnance then the entire item should be marked, secured, and left for specially trained personnel. FAILURE TO FOLLOW THIS GUIDANCE MAY RESULT IN SERIOUS INJURY OR DEATH.

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(4) As the equipment is inspected, the appropriate protective equipment should be worn especially if the BDAR mission requires entering systems that have been hit by depleted uranium rounds.

c. Phase III - EVACUATION. Evacuation is the process of physically moving contaminated and damaged materiel to a collection point or maintenance facility that will perform a more detailed damage assessment and/or repair the materiel.
(1) Recovery personnel should ensure that the Maintenance Control Point (MCP) is informed of the presence of radiological contamination on the equipment.

(2) Prior to movement, RCE should be covered and wrapped with canvas or plastic tarp to prevent spread of contaminants, personnel exposure, and ensure operational security of classified components during transport.

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Double-bag in plastic bags and prominently mark suspected radioactively contaminated items.

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(3) All recovered items should be initially transported to a unit maintenance collection point (UMCP). The higher level MCPs may be in battalion, brigade, division, or corps support areas.

d. Phase IV- RETROGRADE. Retrograde of damaged RCE includes consolidating, cannibalizing and otherwise assessing the contaminated equipment for disposition or further evacuation. See Appendix C for a flow diagram for processing contaminated equipment.

(1) Retrograde operations may begin further forward but should be completed at the ACERT Facility. All damaged and contaminated U.S. materiel will be consolidated at this location.

(2) The Army Contaminated Equipment Retrograde Team (ACERT) may provide on-site technical assistance for retrograde during operations.

(3) Maintenance personnel will complete a detailed assessment of damaged RCE, repair materiel, cannibalize usable materiel components, destroy identified materiel, or initiate retrograde operations.

(4) Repairable RCE is removed, decontaminated and repaired, and the remaining materiel prepared for shipment out of the theater to an AMC designated location.

(5) Contaminated materiel placed in retrograde is a theater loss.

e. Phase V - RECLAMATION. Reclamation includes the decontamination of materiel that could not be decontaminated further forward, usually at an AMC designated facility.

(1) The AMC facility may or may not be in theater; it may be located OCONUS or CONUS.

(2) Once the initial assessment of materials is complete, the AMC will notify the appropriate National Inventory Control Points (NICPs) for management instructions.

(3) Repair is the depot level operation to restore damaged materiel for reissue to military units through military supply distribution system through NICP.

f. Through the U.S. Army Ionizing Radiation Dosimetry Branch (IRBD), provide personnel monitoring devices and services to DA, DCA and DA contractors. Dosimetry will be provided to those personnel determined to receive an external radiation dose in excess of 125 mrem/year.

g. Obtain bioassays, if necessary, on those who have been exposed to perform proper medical surveillance as per AR 11-XX.

2-3. User Operations in Non-Combat Situations

a. Identification of contaminated items:

(1) If one of the types of radioactive commodities listed in Appendix K has been damaged, then contamination from that commodity is a possibility. In peacetime operations at the earliest opportunity “double-bag & tag” the contaminated item. Then take the proper steps to move the suspected RCE to the ACERT facility to be assessed.

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Double-bag in plastic bags and prominently mark suspected radioactively contaminated items.

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(2) If the contaminated item is large, i.e. tank or vehicle, then directly call the ACERT (Appendix F, Section F-1) to provide assistance. If there is no necessity to go in or around the vehicle than do not. Caution should be exercised by recovery personnel while handling damaged material because of unexploded ordnance or contamination.

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b. Contact the RSO, NRC Licensee and command channels about the incident and document all actions undertaken. See appendix J for guidance in preparing documentation of the incident.
c. RCE items will then be transported to a radioactive material collection point, operated at the supporting DS maintenance facility.

2-4. Radioactive Material Collection Facility in Non-Combat Situations
Coordinate transportation of all items identified as contaminated equipment to the ACERT facility. Provide support to units in performing “double-bagging & tagging”.

2-5. ACERT Facility in Non-Combat Situations
a. Assess items identified as contaminated by radioactive material for the purpose of determining if the item can be decontaminated and then released for use; decontaminated and/or cannibalized; or packaged appropriately as radioactive waste and disposed of IAW all relevant guidance.
(1) All radioactive commodities described in Appendix K will be immediately assessed as radioactive waste; no individual shall open such items that are already adequately packaged. If necessary for transportation, the item will be over-packed.
(2) All non-radioactive commodities that have been turned-in as potentially contaminated will be surveyed by all appropriate means (see section 5.3 for General Survey Hints and Techniques) and then either decontaminated and released for use or disposal as a normal item or packaged as radioactive waste.

Chapter 3
Procedures For Handling Of Rce Not Involving DU

3-1. General

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a. This chapter discusses management of RCE that does not include DU. Additional guidance is included in DA PAM 40-18 and AR 11-XX.
b. Proper handling of RCE will-
(1) Accommodate the local situation and provide the maximum level of protection to exposed personnel.
(2) Allow safe return to units as soon as possible.

3-2. Management Guidelines
a. Normal recovery and evacuation procedures as outlined in AR 735-750 will be followed if the item is not contaminated. In the case of contamination, the commander will have the area surrounding the site where the item was located surveyed to determine if the area should be closed off.
(1) Isolate and segregate the contaminated item.
(2) Determine if there are contamination problems in the surrounding area.
(3) Have properly trained personnel survey the area.
(4) If contamination is found, it will be dealt with using the methods outlined in this pamphlet.
b. The commander may decide to use operational RCE equipment. However, appropriate personnel protective clothing will be worn and monitoring for radiological exposure will be done if contaminated equipment is used. See Appendix H for further information.
b. AR 700-xx specifies responsibilities for RCE operations, specifically those operations related to retrograde/disposition of RCE. Assets below theater level used for this purpose, will provide technical assistance to all subordinate units. An ACERT from the IOC (see Appendix F) may provide theater level assistance, however the ACERT may deploy whenever requested to address specific concerns.
c. The processing of damaged and undamaged RCE is based on a series of management guidelines and tasks to be completed by properly designated and trained personnel. These guidelines are designed to permit rapid recovery, repair, or retrograde of damaged and contaminated materiel. These include:
(1) A survey to identify which items are contaminated with radiological sources and to determine the type, level, and location of contamination prior to recovery.
(2) Destruction of unrepairable RCE that may be of value to the enemy. If possible, contact the supporting Radiation Safety Officer(RSO), Surgeon, qualified NBC officer or NCO for further advice on the field destruction of contaminated equipment.

(3) Decontamination or encapsulation prior to repair. Maintenance personnel will be surveyed and monitored for radiological dose exposure (i.e. TLD, bioassay, medical surveillance) during all phases of BDAR operations to identify any radiological contamination and initiate decontamination as appropriate. See Chapter 5 and appendices G through K for further information.
(4) Movement.
(a) RCE will be concealed and contained to the fullest extent possible prior to movement to prevent spread of contamination, “double-bagged and tagged.”
(b) The Material Collection Point (MCP) should be informed of the type, level, and location of contamination prior to unloading the RCE.
(c) The MCP will provide the evacuation crew with specific instructions on where to off-load the RCE.
(5) The MCP support personnel should complete a radioactive survey to identify and confirm the type, level, and location of radioactive contamination prior to commencing repair or cannibalization operations.
(6) Radiological decontamination should be completed at the MCP to permit safe repair or recovery of the materiel. Encapsulation of fixed radioactive contamination is an authorized alternative. Encapsulation includes covering over the contamination with any shielding material (i.e. cardboard, tape, plastic, paint, tape etc.) See Chapter 5, and Appendices G through K, and FM 3-5 for further information.
(7) RCE that cannot be repaired at forward facilities should be evacuated to the next level of maintenance.
(8) If it is determined that a piece of RCE cannot be repaired in theater, the maintenance activity will transfer the item to the ACERT, which will take possession for the retrograde out of theater and final disposition of the item. The NRC licensee should be notified in regards to this action.
(9) Items identified for retrograde to CONUS will be packaged and turned over to Commander, Transportation Movement Control Agency (TMCA) for movement.
(10) Repair of the decontaminated equipment at MCP's is completed IAW AR 735-750 and appropriate materiel-specific technical manuals.
(11) Once an item is repaired and decontaminated IAW AR 385-11 it can be returned to the user or supply system.

3-3. Procedure.
More specific survey and decontamination tasks are discussed in Chapter 5.
a. Notify the RSO, NBC Officer/NCO and Medical Officer/ NCO when handling damaged and contaminated materiel.
b. Soldiers should wear protective clothing to reduce health hazards when operational risk allows.
(1) Personnel will wear respiratory protection (protective mask or approved substitute IAW AR 11-34, The Army Respiratory Protection Program) when working within or on contaminated damaged equipment.
(2) Radiologically contaminated protective masks or respirators and other protective equipment that can not be decontaminated will be disposed of as low level radioactive waste IAW AR 385-11. Mask and respirator filters CAN NOT be decontaminated. Filter change criteria is IAW FM 3-4.
c. Complete a visual inspection to identify explosives hazards.

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d. Isolate and segregate suspected RCE items.

e. Perform radiological contamination surveys. See Chapter 5, Appendices G through K, and FM 3-5 for further information.
(1) Unit personnel under the direction of the unit NBC personnel will perform radiological surveys to identify the type and location of contamination. NOTE: Tritium contamination can not be detected with the AN/VDR-2 or the AN/PDR-77 RADIAC set. The AN/VDR-2 can detect only beta-gamma contamination. The AN/PDR-77 with the alpha probe is used for alpha contamination monitoring.
(2) The survey teams will use an AN/VDR-2 or an AN/PDR-77 RADIAC meter or their equivalent. The objective is to determine the dose rates and location of fixed or removable alpha, beta, or gamma radiological contamination.
(3) Separate known RCE from other equipment.
(4) RCE will be stored in a designated and marked location to await decontamination.
f. Thoroughly decontaminate area as discussed in Chapter 5.
(1) The objective is to reduce possible radiation exposure rates until complete radiological decontamination can be completed.
(2) Radiologically contaminated terrain will be decontaminated to the levels specified in Appendix J or marked to prevent inadvertent spread of or exposure to contamination.
g. Prepare and submit after action reports, see Appendix I for a form to provide the necessary information (an NBC report must be performed).
(1) The type, level, and location of radiological contamination will be identified and reported to higher headquarters as part of established reporting procedures.
(2) Include the names of any personnel that may have handled or assisted in the equipment survey and decontamination to facilitate later medical follow up, if necessary.

Chapter 4

Combat Vehicles Contaminated By The Use Of Du Munitions/Armor.

4-1. General
Accidents and fires can result in varying degrees of damage and contamination to equipment.

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a. Local commanders will establish accident response teams. Commanders at all levels (including installation) should utilize the trained chemical, medical, and maintenance personnel that are on their staffs to formulate response plans for radiological incidents and accidents.
b. In combat, the situation is usually more fluid and threatening. As such, actions which are allowed in combat (e.g. “hasty” decontamination) to minimize impedance to the mission from the immediate threat (enemy). Hasty actions in peacetime or OOTW may not be appropriate, because they may not give due consideration to safety, legal, environmental, and political (e.g. host nation agreement) factors.
c. If the decision is made to re-use the contaminated vehicle due to operational necessity, then the vehicle should be decontaminated at the first operational opportunity. Decontamination at this level consists of:
(1) Exterior of the vehicle is washed down. Maintain appropriate concern for the environment by having the commander establish a central decontamination location and documenting that exact location.
(2) Interior of the vehicle should be vacuumed with a HEPA-vacuum.
d. If the decision is made to not re-use then tag the contaminated vehicle for removal as RCE.
e. Do not enter the vehicle once operational necessity no longer requires it.
f. Limit the spread of contamination by covering appropriately all contamination.

4-2. Management Guidelines
Commanders should be aware of the distinction in paragraph 4-1b above, and, as the situation allows, consider the following guidelines when handling RCE in situations other than combat:
a. CONUS
(1) Depleted Uranium DU in CONUS is subject to U.S. Federal, state, local regulations and policies.
(2) Army Regulations, such as AR 385-11 (Ionizing Radiation Protection) also apply. Army major command chains-of-command will also govern the management of the overall decontamination effort. DA PAM 40-18 and AR 11-XX provide additional guidance.
(3) DU should only be decontaminated at a facility, licensed or approved as appropriate by the U.S. Nuclear Regulatory Commission, Environmental Protection Agency, or the state/locality.
(4) Allowable radiation exposures and equipment release limits will be established IAW the NRC/EPA/state license or permit, and Army regulations.
(5) CONUS operations will be monitored by the major command, other concerned NRC licensees (if a military service) and the U.S. Army Center for Health Promotion and Preventive Medicine, IAW AR 40-5.
b. OCONUS. DU may be subject to U.S. regulations (Alaska/Hawaii/Territories/ Propositioned Ships), but host nation regulations also may apply.
(1) The jurisdiction of the U.S. Environmental Protection Agency and the NRC may apply to OCONUS operations engaged in radiological decontamination operations.
(2) Host nation requirements may be more restrictive than U.S. regulations.

(3) Army regulations, such as AR 385-11 (Ionizing Radiation Protection) may also apply in this area. Army major command chains-of-command will also govern the management of the overall radiological decontamination effort.
(4) Organizations engaging in the retrograde of DU OCONUS will obtain appropriate permits (DA/host nation) prior to beginning any such operations.
(5) Allowable radiation exposures and equipment release limits will be established IAW applicable Federal Regulations, host nation regulations and Army regulations. See RSO for further clarification.
(6) OCONUS operations will be monitored by the major command, the NRC licensee and the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM), IAW AR 40-5.

4-3. Summary of Actions
a. The stability of a non-combat situation allows for a more structured approach to handling radiation incidents and dealing with DU. In most Army facilities using radiation, there is usually a plan in place that mandates the participation of staff elements with essential expertise to handle radiological contamination problems. The necessary skills are usually available to assist with this mission.
b. As a minimum, the guidelines and procedures in this DA Pamphlet will serve to provide adequate management of DU. However, the local NRC license, Agreement State License, ARA or host nation agreement will govern the specific procedures that are used to handle DU that is under non-combat military control. The management of DU at Army facilities will center around:
(1) Use of the logistics system to perform normal missions, including receipt, maintenance, and storage of DU at Army facilities.
(2) A comprehensive worker training program to ensure radiation hazard awareness by all employees in the workplace.
(3) Protecting personnel from unneeded radiation exposure through definite controls such as respirators, personal protection equipment (PPE), special decontamination rooms or buildings and other controls.
(4) Vigorous radiation survey, dosimetry, bioassay and industrial hygiene programs to monitor workers for exposure to health hazards and workplace environments for air concentration of radioactive materials in excess of allowable limits.
(5) Isolating exposure to contaminated parts from those known not to be contaminated.
(6) Disposal of radiologically contaminated parts as low level radioactive waste through the IOC LLRW Office. Classified contaminated parts will be disposed of IAW IOC protocol.
(7) Formal program reviews by management and regulatory authorities.
c. For specific procedures for handling NRC/ARA licensed equipment items in areas under NRC jurisdiction consult the specific NRC license, ARA, or installation radiation safety regulation for information on handling DU at a particular facility. Appendix E, paragraph E-4, lists points of contact who will be able to provide assistance.

Chapter 5

Commodities Other Than Vehicles

5-1. General

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a. Experience with the recovery of vehicles and equipment that were radiologically contaminated has shown that recovery and retrograde of the items can occur without serious impact on the capability of the teams to perform the mission. However, that does not mean the process should be treated lightly and performed without precautions. This information is provided for people working with this equipment in conjunction with ACERT or in the course of duty.
b. The purpose of this pamphlet is to alert those involved with the recovery and retrograde of equipment to precautions that should be taken in handling such equipment. Lessons that have been learned throughout recovery and retrograde procedures are listed in this chapter to provide that alert.

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Double-bag in plastic bags and prominently mark suspected radioactively contaminated items.

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c. Use FM 3-5 as a comprehensive and authoritative guidance for decontamination operations. The following guidance is provided as a supplement and for easy reference.

5-2. Personal Protective Measures
a. General
(1) Once an item has been identified as damaged and thus potentially contaminated, it should be double-bagged and tagged ASAP. Handling of the item should be minimized to the maximum extent possible. Once the radioactive commodity has been so isolated (double-bagged and tagged), it should not be removed from the bag. The entire bag should be considered as low level radioactive waste and treated as such.
(2) The primary source of internal contamination is ingestion; that is a transfer of hazardous material from hands to mouth. Thus, in handling the contaminated equipment, disposable gloves should be worn, if at all possible. However lack of disposable gloves should not prevent the item from being double-bagged and tagged as soon as possible. If gloves are not available, the individual should wash/wipe their hands thoroughly as soon as possible.
(3) If any of the above commodities are involved in a fire, then personnel should stand upwind from the fire to the greatest extent possible.
(4) Self or equipment monitoring is recommended at the earliest appropriate opportunity.
(5) Personnel involved in the handling of contaminated equipment should report to their chain of command at the earliest appropriate time.
b. DU Contamination

(1) Gloves. Anyone involved with the handling of combat vehicles or articles/personnel with in the vehicle should be wearing gloves. These gloves should allow fine manipulation and not be easily ripped or torn (cotton gloves are recommended).
(2) For people who enter damaged combat vehicles that are suspected to be contaminated, they should have a respirator and be wearing gloves, ty-vacs, and shoe covers.
(3) If you are performing field decontamination - personal protection equipment is required, cross-reference environmental concerns and mark the area of suspected contamination to prevent use as a bivouac site.
(4) If the decision has been made to re-use the combat vehicle at the depot level, then the above personal protective measures are adequate.
c. Personnel handling casualties contaminated from source breaches of AN/UDM-2, AN/UDM-6, M8A1, MC-1 devices. All disposal items involved in the handling of such contaminated casualties should be separated, double-bagged, and tagged as potential radioactive waste.

5-3. General Survey Hints and Techniques
a. Once a piece of equipment has been identified as potentially contaminated, MARK IT! That is probably the single best thing that can be done to save exposure to personnel and extra work later. If the item enters the logistics system, all paperwork accompanying the item should be marked “contaminated”.
b. Avoid touching equipment that might be contaminated. Wear a good grade of leather gloves, as a minimum. The handling of equipment that has been in combat might result in sharp edges that will cause cuts and scratches to bare skin. Contamination will enter the body unless the wounds are covered. Wear surgeon’s gloves under the leather gloves. See Appendix G for more information. The use of respiratory protection may be required. Recommend personnel remain upwind, if possible, from potentially contaminated equipment and areas.
c. Isolate suspected contaminated items.
(1) When the tactical situation permits, isolate the equipment in a location specified by unit chemical or medical personnel. The selected area will be away from bivouac locations, medical facilities, dining areas, and bathing/laundry facilities. The objective is to limit the spread of contamination while determining logistical requirements.
(2) The exclusion zone for damaged and contaminated equipment that contains or may contain unexploded ordnance is at least 366 meters. The exclusion zone for radiologically contaminated equipment is at least 50 meters in any direction.
(3) Do NOT eat, drink, smoke, chew tobacco, or apply cosmetics when around potentially contaminated equipment. Through hand or glove contact, radioactive contamination may attach itself to substances ingested and cause internal contamination.
(4) Pay attention to nutrition and hydration requirements. Eat three meals a day. Drink fluids, preferably approved water, to maintain hydration. Handling of contaminated equipment, especially in hot climates, may require protective clothing such as Mission Oriented Protective Posture (MOPP). Extra nutrition and hydration will be needed under those circumstances.
(5) Pay conscious attention for heat and cold injuries. The use of protective clothing will insulate the body and prevent the efficient transmission of heat and moisture away from the skin surface. See FM 21-10 for suggested work rest cycles during different heat categories.
(6) If an accident happens (cut, scrape, etc.) report it immediately and seek medical help.
(7) The long, exhaustive nature of recovery and retrograde work demands that sleep/rest cycles be enforced.
(8) Clothes should be changed frequently and kept clean. Dirt and perspiration will impair the ventilatory aspects of the clothing. Washing clothes may be a problem due to potential contamination. Ensure that

potentially contaminated clothes are washed separately from other troop clothing. Water should be tested, if possible, to ensure that it is not contaminated above release limits before it is released to the sewer system or placed on the ground. Contaminated water will be held as radioactive waste.
(9) Keep fingernails cut closely to avoid getting contamination under the nails.
(10) Cut hair to about one-quarter inch from the scalp or cover it.
(11) Pay attention to bodily function requirements. Due to the nature of constantly being in protective clothing, opportunities to use latrines may be limited. If possible, plan ahead.
(12) Assemble equipment that will be needed ahead of time. Survey equipment, etc. should all be together for ease of usage. Appendix G provides a list of suggested supplies and equipment involved with these operations.
(13) Separate contaminated items from non contaminated items. Establish a “hot line” around the equipment work area or vehicle. Do NOT exit the contaminated area without surveying shoes and clothes for contamination. Contact chemical personnel or RSO for assistance in setting up a “hot line”.
(14) Utilize the two person rule when performing equipment decontamination and retrograde. Ensure that communications are present and functioning prior to the start of the work, especially in remote areas.

5-4. DU Equipment

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Unless required by operational necessity, no one should enter a vehicle potentially contaminated with DU. If they do, follow personal protection measures outlined above.

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a. Appearance.
(1) The DU residue from equipment that is impacted will appear as a heavy black residue, with particle sizes ranging from that of cigarette ash to that of marbles.
(2) Spalling at or near holes in equipment made by DU appears as fragments melted into reheated solder. Spalling will also be present inside the equipment. They originate from the impact of DU into equipment.

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WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING

Damaged or destroyed Abrams, Bradleys, and other vehicles may contain unexploded or unstable ordnance. This ordnance, which may retain its normal shape or look different, may explode upon contact or movement. Only explosive trained personnel will move or handle unexploded and damaged munitions. If materiel is a catastrophic loss and an inspection indicates the presence of unexploded ordnance then the entire item should be marked, secured, and left for specially trained personnel. FAILURE TO FOLLOW THIS GUIDANCE MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING
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b. When entering a vehicle potentially contaminated with DU, expect that there will be resuspension of particles that have settled to the floor. A dust may be created. Therefore:
(1) Wear protective clothing, MOPP or clothing that will provide a barrier between the body and the contamination.
(2) Wear respiratory protection. The M17/40 series masks are preferred. This mask is very effective in protecting the soldier from the inhalation of DU particles. If these masks are unable to be used, use ordinary substitutes, such as a handkerchief, t-shirt, towel, or other item. In an urgent situation, ordinary substitutes are better than no protection at all.
(3) If a protective mask is not worn, wear eye protection (standard safety goggles equivalent to ANSI standard Z87.1 will do. Safety glasses ordered through the federal supply system are ANSI approved).
(4) Wear a good grade of leather boot. Standard troop issue leather boots are sufficient.
(5) When in the vehicle, don't lean or sit on the equipment surface if possible. If this is done, clothing may be contaminated. Radiation surveys will detect contamination after exit from the equipment.
(6) Utilize the two person rule (or more) when performing decontamination and retrograde operations. With vehicles, one person should be stationed on top of the vehicle to watch others who are inside.
c. When surveying/assessing equipment, survey personnel should:
(1) Before beginning, ensure that the survey instrument is operative, in calibration, and that the proper probe is used (AN/PDR-77). NOTE: DU armor will trigger the survey meter.
(2) Hold the survey instrument approximately 1/2 inch away from the surface to be surveyed and keep the probe at the same distance throughout the survey.
(3) Take a background reading from an area known NOT to be contaminated.
(4) Make a conscious effort not to contaminate the probe during the survey. If the probe is contaminated, then it must be cleaned or the instrument replaced prior to continuing the survey. Instruments are calibrated with probes as a set. Therefore, probes cannot be switched to a different instrument without affecting the calibration.
(5) Record readings on a sheet with all the essential information. See Appendix I for a sample survey sheet.
d. When decontaminating equipment:
(1) Loose radioactive contamination can be brushed off, scooped up, vacuumed up with a vacuum modified to include a High-Efficiency Particulate Air Filter (HEPA), washed off, or removed with tape or other sticky material. Decontaminate equipment to the levels specified in Appendix J.
(2) Fixed contamination can be covered over (encapsulated) with any available materiel that provides shielding and consequently reduces radiological exposure rates. Cardboard, plastic, cloth, or paint provide acceptable shielding for alpha and beta contamination. A RADIAC meter will be used to determine and record dose rates before and after encapsulation. The objective is to reduce fixed contamination radiological exposure rates to the levels specified in Appendix J if possible until decontamination can be completed per commanders guidance.
(3) Small pieces of equipment/materiel that can not be decontaminated and that are not needed for mission completion will be double-bagged and turned in to the supply system for proper disposal.
(4) See Appendices E-K for further information on decontamination procedures.
e. When the work session is finished, survey personnel, PPE, and Boots for contamination. Clean off any contaminated items, if possible. Store clothing for reuse, or place in an area or container reserved for contaminated material. Rags and other trash should be disposed of as radioactive waste. See Appendix H for more techniques on personnel decontamination. Prepare a written after action report. Such information is vital for reconstructing after-the-fact who was where and did what.

5-5. DU Munitions

a. When handling depleted uranium ammunition that has NOT been fired:

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WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING

Unfired DU ammunition, either intact or damaged, may be unstable. This ordnance, which may retain its normal shape or look different, may explode upon contact or movement. Only explosive trained personnel will move or handle unexploded and damaged munitions. FAILURE TO FOLLOW THIS GUIDANCE MAY RESULT IN SERIOUS INJURY OR DEATH.

WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING
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(1) Have EOD perform render safe procedures.
(2) If ammunition appears intact, the DU is probably intact. Perform normal TI and maintenance procedures.
(3) If the ammunition appears damaged, perform wipe tests on outside of ammunition and hold wipe (in gloved hand) next to beta probe of the AN/VDR 2. If the meter reads more than twice background, contamination may be present. Treat as contaminated per the applicable ammunition TM.
(4) Perform a radiation survey of the area in which damaged systems were stored to rule out any contamination. Use a AN/VDR-2, or an AN/PDR-77 RADIAC Meter with the beta probe to measure for any radiation levels. Levels more than twice the background indicate potential contamination. Wipe tests should be performed to definitely rule out contamination. Send the wipe tests to the Rock Island Independent Test Laboratory or to your supporting facility with a qualified laboratory. Address is given in Appendix E. Potentially contaminated areas should not be used for unrestricted activities until surveyed and cleared by the RSO.
(5) Contact the NRC licensee (HQ IOC, address in Appendix E) for further information.

5-6. Tritium Commodities
a. For handling items containing tritium, such as fire control azimuths, level gauges, collimators, and muzzle reference sensors:
(1) Before handling tritium items, put on surgeon’s gloves. Personnel who regularly inspect or repair tritium devices should have a baseline bioassay to measure for tritium in the urine. Contact the NRC licensee, U.S. Army ACALA (Address in Appendix E), for further information.
(2) Check the item to see if the part containing the tritium is glowing. If it is, then at least part of the tritium activity is still present. If it is not, the tritium charge is depleted--assume then the item is contaminated.
(3) Place contaminated items in double plastic bags (at least 4 mil thickness). IT IS IMPORTANT NOT TO REMOVE THE ITEM FROM THE PLASTIC BAGS UNTIL THE ITEM REACHES ITS ULTIMATE DESTINATION. ENSURE THE PACKAGE CONTAINING THE ITEM IS MARKED “CONTAMINATED”.
(4) Depending on the decision of the item manager, either send to the appropriate level of repair (based on the technical inspection), or turn into ACERT for disposal as radioactive waste.
(5) Potentially contaminated areas should not be used for unrestricted activities until surveyed and cleared by the RSO. Perform a radiation survey of the area in which damaged systems were stored to rule out any contamination. Wipe tests should be performed to definitely rule out contamination. Send the wipe tests to one of the laboratories listed in Appendix E, E-4a and E-4b, or to your supporting facility with a qualified laboratory.

(6) In CONUS, contact the NRC licensee (HQ ACALA, address in Appendix E) for further information. The applicable TM also contains guidance on handling these devices.

5-7. M8A1/M43A1 Chemical Agent Detectors

a. If working with M8A1/M43A1 chemical agent detectors (containing americium 241) or chemical agent monitors (containing Nickel 63):

(1) Before handling these items, don plastic gloves.

(2) If the items appear intact and unharmed, the radioactive cell(s) are probably intact, also. Normal Technical Inspection (TI) procedures should be followed per TM 3-6665-312-12&P (M8/M43 Operator's Manual), TM 3-6665-312-30&P (M8/M43 Intermediate DS Maintenance Manual), TM 3-6665-331-10, (CAM Operator's Manual), or TM 3-6665-331-23&P (CAM Unit and Direct Support Maintenance Manual).

(3) If the items are damaged, obtain the item manager's instructions as to disposition. Place items in double plastic bags (at least 4 mil thickness). IT IS IMPORTANT NOT TO REMOVE THE ITEM FROM THE PLASTIC BAGS UNTIL THE ITEM REACHES ITS ULTIMATE DESTINATION. ENSURE THE PACKAGE CONTAINING THE ITEM IS MARKED "DAMAGED--POTENTIALLY CONTAMINATED".

(4) Potentially contaminated areas should not be used for unrestricted activities until surveyed and cleared by the RSO. Perform a radiation survey of the area in which damaged systems were stored to rule out any contamination Use a AN/VDR-2, or an AN/PDR-77 RADIAC Meter with the probe to measure for any radiation levels. Levels more than twice the background indicate potential contamination. Wipe tests should be performed to definitely rule out contamination. Send the wipe tests to your supporting facility with a qualified laboratory. Address is given in Appendix E-4a and 4b. Potentially contaminated areas should not be used for unrestricted activities until surveyed and cleared by the RSO.

(5) Contact the licensee (HQ ACALA, address in Appendix E) for further information.

5-8. MC-1 Soil Moisture Density Tester

a. If working with the MC-1 Soil Moisture Density Tester:

(1) Obtain a whole body radiation dosimeter and, if time permits, a neutron dosimeter. If a neutron dosimeter can not be issued, the RSO must annotate the types of sources the whole body dosimeter is exposed to on the "Dosimeter Issue Listing" computer print out. Contact your RSO for assistance.

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WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING

The MC-1 Soil Moisture Tester contains two radioactive sources, an americium-241 and a cesium-137 source, that could emit hazardous radiation levels if damaged with the source area in the open position. Am-241 is an alpha emitter which poses no external hazard. However, the americium is combined with beryllium. The Am-241 alphas could cause the mixed beryllium to eject neutrons. So, in addition to containing Cs-137, the MC-1 is a neutron and gamma emitter and is very dangerous. Prior to handling or retrograding any MC-1 Tester, obtain a beta/gamma radiation survey instrument, such as a VDR-2 or PDR-77 as well as a neutron meter if possible, and, after verifying proper operation, approach the tester with the instrument "on" and the probe pointed toward the instrument. If the radiation levels are noticeably above background and rise as the tester is approached, assume the source is open and do not go further. Evacuate the area for a radius of 50 meters and call

the RSO for help. Additionally, contact the US Army TACOM for further guidance (Address in Appendix E) if this situation occurs.

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(2) If the tester appears undamaged and the source is locked in the closed position, the tester is probably intact and not contaminated. However, when approaching a tester that has been turned in or abandoned after combat, obtain a beta/gamma radiation survey instrument and as well as a neutron survey meter, if available. After verifying proper operation, approach the tester with the instrument "on" and the probe pointed toward the instrument.
(3) If the levels are less than twice background as measured 50 meters distance from the source and the levels do not rise dramatically as the tester is approached, then conditions are safe for continued operations. Perform normal TI operations and other handling per TM 5-6635-386-12&P, MC-1 Unit Maintenance Manual.
(4) If the radiation levels are noticeably above background and rise as the tester is approached, assume the source is open and do not go further. Evacuate the area and call the RSO for help. The tester should be packaged and shielded as well as possible prior to turn-in. Store in an approved radioactive materials storage area. The package should be surveyed for radiation levels with a VDR-2 or a PDR-77 to ensure safe radiation levels exist in outside the package. See TM 5-6665-386-12&P for further information.
(5) Once a defective tester has been removed to a proper radioactive materials storage area, the area should be surveyed and cleared by the RSO.
(6) Contact the NRC licensee (US. Army TACOM, address at Appendix E) for further information.

5-9. RADIAC Calibrators Containing Strontium (AN/UDM-2) or Plutonium (AN/UDM-6):
a. When handling RADIAC Calibrators containing Strontium (AN/UDM-2) or Plutonium (AN/UDM-6):

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WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING

The AN/UDM 2 RADIAC calibrator could emit hazardous levels of beta and gamma radiation if the radioactive source is damaged and not properly contained. Prior to handling or retrograding any AN/UDM2 calibrator, obtain a beta/gamma radiation survey instrument and, after verifying proper operation, approach the calibrator with the instrument "on" and the beta/gamma probe pointed toward the instrument. If the radiation levels are 2 mR/hr above background and rise as the calibrator is approached, assume the source is damaged and do not go further. Evacuate the area for a radius of 20 meters and call the RSO for help. Additionally, contact the US Army CECOM through command channels for further guidance (Address in Appendix E) if this situation occurs.

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The AN/UDM-6 RADIAC calibrator contains Plutonium-239, a radioactive material that is an alpha emitter and an internal hazard. Pay particular attention to the chance of ingesting Plutonium when working with this item.

Do not eat, drink, or smoke when handling this or any other radioactive item. Wear gloves and overgarment when handling this item.

WARNING WARNING WARNING WARNING WARNING WARNING WARNING WARNING
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(1) RADIAC calibrators that appear undamaged probably contain intact radioactive sources. Nevertheless, caution should still be exercised when handling these items.
(2) To evaluate the AN/UDM-6, obtain an alpha radiation survey instrument such as the AN/PDR-77 with alpha probe and verify the instrument's operation. Measure the radiation levels near the calibrator to determine the radiation level. If the radiation level is less than twice the background level, assume the levels to be safe. To evaluate the AN/UDM-2, obtain a beta/gamma survey instrument and verify the instrument's operation. Measure the radiation levels as you approach the calibrator. If the radiation levels are less than 2 mr/hr, assume that the levels are safe.
(3) Wear gloves and an overgarment. Obtain radiation dosimeter, if one has already not been issued. Contact your RSO to obtain the dosimeter.
(4) Perform normal TI procedures and handling per TM 11-6665-227-12 or TB 11-6665-227-12 (AN/UDM-2) or TM 11-6665-248-10 (AN/UDM 6).
(5) Calibrators to be turned in for repair or salvage should be double-bagged in thick (at least 4 mil) plastic bags. Send to next level of repair or to theater collection point, whichever applies.
(6) Perform a radiation survey of the area to verify that the area is not contaminated in excess of release limits.
(7) Contact the licensee (HQ CECOM, address in Appendix E) for further information.

5-10. Night Vision Devices Containing Thorium
a. For handling night vision devices containing thorium:
(1) If the night sight appears unbroken, the thorium coating is probably intact. The radioactive thorium is applied as a thin coating on the surface of the glass to improve its performance.
(2) With broken items, there exists a hazard from broken glass as well as from the radioactive coating on the glass.
(3) Likely problem with these items will involve breakage from combat or over purging. In case of breakage, protection will center around protection of the skin form shards of glass and the respiratory tract from thorium dust.
(4) Wear leather gloves when handling the thorium lenses and if broken, a dust mask.
(5) Perform TI procedures according to the applicable TM.
(6) Double bag items to be turned in to the next higher level of maintenance or to the theater collection point.
(7) Perform a radiation survey of the area to verify that the area is not contaminated in excess of the release limits listed in Appendix J.
(8) Contact the NRC licensee (HQ CECOM, address in Appendix E) for further information

5-11. Radium Devices
a. Devices containing radium-226 should currently not be in the supply system. Radium emits alpha, beta, and gamma radiation and can cause a significant amount of exposure.
b. Immediately contact the RSO and IOC for details on how to remove the materials from the supply system.
c. Obtain a whole body dosimeter prior to surveying.

d. The detectors will pick up significant levels of activity. The commodity should be double bagged and tagged as soon as possible and the area surveyed where the commodity was to see if there was any significant contamination. Prominently label the packaging and send to IOC.

Chapter 6
Foreign Or Captured Items Containing Radioactive Material

6-1. General

a. Radioactive materials have long been used in both U.S. and foreign equipment to facilitate performance. The same kinds of radioactive components (night sights, surge arrestors, calibrators, and other equipment) used by the U.S. will be found in foreign made materiel, both of U.S. allies and its adversaries.

b. Past experience indicates that many gauges and other luminescent devices in captured foreign materiel contain radium. Radium luminescent paint is easily rubbed off and could be taken in to the body. Take special care in surveying for, safeguarding and decontaminating as necessary such luminescent devices.

6-2. Handling Guidelines

The radioactive materials in foreign or captured equipment is subject to the same kinds of contamination potential as the U.S. equipment. Therefore, any captured or damaged foreign equipment should be handled the same manner as similar U.S. equipment. Some guidelines:

a. Assume abandoned or captured equipment may be contaminated until proven otherwise, especially if the equipment has been hit or damaged in combat. Exercise the basic precautions of using disposable gloves - unless the material is DU contamination, in which case all U.S. source guidelines should be followed

b. Follow all appropriate guidelines established in earlier chapters.

c. The specific radioactive materials (e.g. radium, tritium, americium, etc.) may or may not be the same activity as the American counterpart.

d. The precautions in handling foreign RCE should be based on the specific radioactive materials involved rather than the type of component in which the radioactive source is installed.

e. The precautions and guidelines used in this pamphlet will generally apply to foreign sources, once the specific radioactive source(s) has(ve) been identified.

f. If tasked with handling of allied equipment that contains radioactive sources, consult with the allied representative as to specific precautions to be taken for that item.

g. Consult FSTC Guidebook No. AST-1500Z-100-93, Identification Guide for Radioactive Sources in Foreign Materiel, for specific identification of the sources to be found in foreign (captured) equipment.

h. Be alert for gauges with damaged radioactive dial indicators. They are probably contaminated.

6-3. War Trophies

All equipment shipped back to an authorized collection point will be inspected by the U.S. Customs Service prior to embarkation at port. Equipment must comply with U.S. federal regulations (NRC, EPA, Department of Agriculture) prior to acceptance at the port of entry in the United States. Units claiming this equipment must ensure the equipment has been cleared of:

a. Security considerations.

b. Radioactive Material contamination considerations as discussed throughout this pamphlet.

c. Hazardous Materials considerations. Contact your unit surgeon and engineer for assistance in this area.

d. Agricultural contamination.

Appendix A

References

Army Regulation (AR) 40-5, Preventive Medicine

AR 11-XX, The Army Radiation Safety Program

AR 11-34, The Army Respiratory Protection Program

AR 40-13, Medical Support-Nuclear/Chemical Accidents and Incidents

AR 55-355, Defense Traffic Management

AR 385-40, Accident Reporting and Records

AR 700-XX, Management of Radioactively Contaminated Equipment

Radioactive Commodities in the DoD Supply System

AR 750-1, Army Materiel Maintenance Policy and Retail Maintenance Operations

AR 750-25, The Army Test, Measurement, Diagnostic Equipment Program

DA Pamphlet 40-18, Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation

Field Manual (FM) 3-3-1, Nuclear Contamination Avoidance

FM 3-4, NBC Protection

FM 3-5, Decontamination Operations

FM 8-9, NATO Handbook of the Medical Aspects of NBC Defense Operations

FM 9-43-1, Unit Maintenance Operations

FM 9-43-2, Recovery and Battlefield Damage Assessment and Repair

FM 21-10, Field Hygiene and Sanitation

FM 43-5, Unit Maintenance Operations

Technical Bulletin (TB) 9-1300-278, Guidelines for Safe Response to Handling, Storage, and Transportation Accidents Involving Army tank Munitions or Armor which Contain Depleted Uranium

TB 11-6665-227-12, Safe Handling, Storage, and Transportation of Calibrator Set, RADIAC, AN/UDM-2

Technical Manual (TM) 3-261, Handling of Unwanted Radioactive Material

TM 55-315, Fire Fighting and Rescue Procedures in Theaters of Operations

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

TM 3-6665-312-30&P, Intermediate Direct Support Maintenance Manual (including Repair Parts and Special Tools List) for M8A1 Automatic Chemical Agent Alarm.)

TM 3-6665-331-10, Operator's Manual for the Chemical Agent Monitor

TM 3-6665-331-23&P Unit and Direct Support Maintenance Manual (including Repair Parts and Special Tools List) for the Chemical Agent Monitor

TM 5-6635-386-12&P, MC-1 Unit Maintenance Manual for Tester, Density and Moisture (Soil and Asphalt), Nuclear Method (Campbell-Pacific Model MC-1)

TM 11-6665-227-12, Operator's and Organizational Maintenance Manual for Calibrator Set, RADIAC, AN/UDM-2

TM 11-6665-248-10, Operator's Manual for Calibrator, RADIAC, AN/UDM-6

Army Industrial Operations Command Pamphlet 385-1, Handling of Unwanted Radioactive Material

Foreign Science and Technology Center (FSTC) Guidebook AST-1500Z-100-93, Radiation Protection Officer's Guidebook, Identification Guide for Radioactive Sources in Foreign Materiel

Title 10, Code of Federal Regulations (CFR), Energy (NRC Regulations)

Title 40, CFR, Environmental Protection Agency Regulations

Title 49, CFR, Transportation Regulations

ACE Dir 80-63, ACE Policy for Defensive Measures Against Radiological Hazards During Peacekeeping Operations, dated 12 January 1996

Joint Pub 3-11, Joint Doctrine for Nuclear, Biological, and Chemical (NBC)

Appendix B

Glossary

ALARA. As Low As Is Reasonably Achievable. The principle of making every reasonable effort to maintain exposures to radiation as far below the dose limits in Part 20 of Title 10 of the Code of Federal Regulations as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the benefits to the public health and safety, and other societal, socioeconomic considerations and in relation to utilization of nuclear energy and licensed materials in the public interest.

ACERT. Army Contaminated Equipment Retrograde Team.

ARA. Army Radiation Authorization

ARP. Army Radiation Permit

BDAR. Battlefield Damage Assessment and Repair.

CONTAMINATED EQUIPMENT. Contaminated materiel refers to U.S. or foreign MTOE, CTA, TDA, or PLL items that were contaminated with radioactive materials or mixed waste as a result of combat action, maintenance activities, or accidents.

CONUS. Continental United States.

DECONTAMINATION. The process by which radioactive and/or mixed waste materials are removed from materiel.

DS/GS. Direct Support/General Support.

DU. Depleted Uranium. Depleted uranium is a by-product of the uranium fuel enrichment process. As a result this by-product or waste stream contains lower concentrations (depleted) of the U-234/U-235 radioisotopes than was contained in the original uranium (U-238) ore.

EOD Teams. Explosive Ordnance Disposal. EOD teams.

FEBA. Forward Edge Battle Area.

FOREIGN ITEMS. Materiel manufactured by other countries.

FREE RELEASE. Decontaminated materiel released for unrestricted use by the general public.

HEALTH PHYSICS. The science of determining, evaluating, and controlling the health effects of exposure to ionizing and non-ionizing radiation.

HEPA. High Efficiency Particulate, Air 99.97% efficencient in collecting particulates from the air.

HOST NATION. The country(ies) where U.S. Forces are conducting operations by mutual agreement.

IAW. In Accordance With.

IOC. Industrial Operations Command.

IRDB. Ionizing Radiation Dosimetry Branch.

LAR/LAO. Logistics Assistance Representative/Logistics Assistance Officer. Individuals assigned by AMC to provide on-site logistical (item management) liaison and assistance with AMC fielded items.

LLRW. Low Level Radioactive Waste. (Radioactive Waste) Unwanted solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Acts, as amended, and falls below the threshold for activity and quantity listed in 10 CFR 62.2, and is of negligible economic value considering the cost of recovery.

MATERIEL. Equipment, vehicles, and other commodities to include supply items.

METT-TC. Mission, Enemy, Troops, Time, Terrain, Civilian Conditions

MCP. Material Collection Point.

MIXED WASTE. Combustion or detonation byproducts of petroleum, oil, lubricants, or materiel contained within a piece of equipment. Mixed waste also includes radiologically contaminated items.

MOPP. Mission Oriented Protective Posture.

NRC. Nuclear Regulatory Commission.

OOTW. Operations Other Than War.

PPE. Personal Protective Equipment.

QASAS. Quality Assurance Specialist Ammunition Surveillance.

RADIAC. Radiation Detection, Identification, and Computation.

RADIOACTIVE COMMODITIES. Commodities (widely fielded items) that contain radioactive materials.

RADIOACTIVE MATERIALS. The term radioactive materials is interchangeable with phrase radioactive material, damaged radioactive materials, radioactive materials requiring retrograde, materials contaminated with radioactive materials. Radioactive materials includes radioactive mixed waste.

RCE. Radiologically Contaminated Equipment.

RETROGRADE. A maneuver to the rear or away from the enemy.

RISK ASSESSMENT. The first two steps of the risk management process.

RISK DECISION. The decision to accept or not accept the risk(s) associated with an action made by the individual responsible for performing that action.

RISK MANAGEMENT. The process of weighing identifying and controlling hazards to protect the force.

RISK MANAGEMENT PROCESS. The process of identifying and controlling hazards to protect the force. It includes five steps that represent a logical thought process from which users develop tools, techniques and procedures for applying risk management in their areas of responsibility. It is a closed-loop process applicable to any situation and environment. Its five steps are:

a. Identify hazards: Identify hazards to the force. Consider all aspects of the current and future situations, environment and known historical problem areas.

b. Assess hazards: Assess hazards to determine risks. Assess the impact of each hazard in terms of potential loss and cost.

c. Develop controls and make risk decisions: Develop control measures that eliminate the hazard or reduce its risk. As control measures are developed, reevaluate risks until all risks are reduced to a level where benefits outweigh potential costs.

d. Implement controls: Put controls in place that reduce the risk.

e. Supervise and evaluate: Enforce standards and controls. Evaluate the effectiveness of the controls and adjust/update as necessary.

RISK MANAGEMENT INTEGRATION. The method of firmly fixing the risk management process as a principle for individuals and organizations.

RADIATION PROTECTION/STAFF/SAFETY/CONTROL OFFICER (Also known as RSO/RPO/RSO/RCO). The individual designated by the commander as chief advisor and responsible party for all matters related to radioactive materials within an individual command.

SITREP. Situation Report.

SOP. Standing Operating Procedures.

TAACOM. Theater Area Army Command.

TI. Technical Inspection.

TMCA. Transportation Movement Control Agency.

TMDE. Test, Measurement and Diagnostic Equipment.

TRANSPORTATION STANDARDS. Department of Transportation requirements established under Title 49 of the U.S. Code of Federal Regulations.

UNRESTRICTED USE. Same as Free Release.

UNWANTED RADIOACTIVE MATERIAL. Radioactive materials that have been damaged or have reached the end of their useful life and have been determined to no longer serve the purpose for which they were intended.

Appendix C
Flow Chart For Processing Equipment

Appendix D
Health Effects Of Radiation

D-1. Radiation Basics
a. Radiation is energy coming from a source. There are many kinds of radiation from many different kinds of sources. Every kind of radiation is useful for something, but sometimes the radiation can also be harmful. Sunlight, x-rays, radio waves and microwaves are some different kinds of radiation, and all of these are useful but can sometimes be harmful. Radiation of any kind becomes harmful when we are exposed to too much of it.
b. There are several forms of radiation. The most common types of ionizing radiation are alpha, beta, gamma and neutron. Both nuclear radiation and x-ray radiation are extremely useful. They are both high energy radiation and both are very penetrating. Both nuclear radiation and x-ray radiation are commonly called ionizing radiation, because of what they do to atoms.
c. Forms of elements which emit nuclear radiation from the nucleus of the atoms are called radioactive (isotopes). Uranium and radon are common, naturally occurring radioactive elements. Uranium can be refined for nuclear reactor fuel. The energy from ionizing radiation from the uranium in reactors produces electricity. Radioactive cobalt, radioactive cesium and radioactive iodine produce ionizing radiation used by doctors in hospitals to cure serious diseases like cancer. Tritium, americium and radioactive nickel are used in military equipment for very useful purposes like lighting without batteries and chemical agent detection.

D-2. Radioactive Materials Used by the Military
a. Depleted Uranium.
(1) When uranium is refined to make nuclear fuel, waste uranium is also produced. The waste uranium is called depleted uranium (DU). The waste DU produces only very small amounts of ionizing radiation, and because it is much more dense than lead, it is very useful for armor plating and armor piercing ammunition. The radiation from DU is only slightly stronger than the ionizing radiation normally coming from the soil and from the air, so

soldiers can work around DU with minimal effects. Remember, as stated earlier, radiation only becomes harmful when we are exposed to too much. Protective clothing and gloves, respiratory protection for airborne DU and good hygiene practices will minimize the hazard.
(2) Heavy metal poisoning is the main health concern associated with DU. Lead poisoning from sources like lead based paint is well known heavy metal poisoning. Like lead, DU is a heavy metal. Everyone is aware of the social problem of lead poisoning. All heavy metals, including lead and DU, can poison us if we take enough into our body. For this reason, we prevent and caution soldiers against inhaling or swallowing DU. Lead is a poison that affects virtually every system of the body. The risks of lead exposure are well known from studies of children and high dose occupational exposure. The U.S. now bears the high social costs related to lead poisoning. When military equipment containing DU burns or when DU ammunition is used, DU becomes scattered as contamination. The contamination will be in the dust. The dust will be inhaled or swallowed unless soldiers protect themselves when working in contaminated areas. In light contamination a kerchief over the nose may be sufficient, but in heavy contamination the NBC protective mask may be necessary. After leaving a DU contaminated area soldiers must get the dust out of their clothing and wash contaminated skin.
b. Tritium.
(1) Tritium is the radioactive form of the abundant element hydrogen. It is used whenever it is necessary to have light without an electrical source. Sometimes tritium is mixed with other gases in a glass tube and sometimes it is an ingredient of paint. Tritium produces very low energy nuclear radiation as beta radiation. The beta radiation from tritium causes other ingredients of the gas or paint to glow very brightly. That glow is a very useful light source.
(2) Tritium is a very minor heath concern for military personnel. The beta radiation from tritium has so little energy it cannot penetrate the glass tube containing the gas or the glass cover over painted sources. It cannot even penetrate skin. Tritium can only damage the body when a large amount gets inside the body where there is no skin to protect the cells from the beta radiation. This can happen when someone inhales the gas escaping from a broken or leaking glass tube containing tritium. Tritium can also build up in the air and on surfaces in storage areas where a tiny amount of tritium is constantly leaking from hundreds or thousands of undamaged stored items, such as tritium watches or compasses. Persons must exercise caution when close to damaged tubes containing tritium gas, especially, immediately after breakage. Also exercise caution in tritium device storage areas and when handling large numbers of tritium items.
c. Americium.
(1) Americium is the radioactive element that is used in the M43A1 Chemical Agent Monitor of the M8A1 Chemical Agent Alarm system. It produces highly energetic alpha particles which also cause the americium atoms to produce weak x-rays.
(2) Outside of the body, americium is not a health concern. Alpha particles do not penetrate skin. But, inside the body the americium alpha radiation is very damaging to cells. The detector cell of the M43A1 is very rugged and will survive fires as well as nearly catastrophic destruction of the monitor. Leakage of americium is slightly possible from even undamaged monitors and detector cells. As a precaution, all detector cells should be considered contaminated unless the cell outlet port has recently been wipe tested and is negative for contamination. Americium contamination will usually only enter the body through swallowing. Thorough handwashing after handling will prevent ingestion.

D-3. Other Radioactive Elements
Several other radioactive materials are used for various purposes in many other military items of equipment. Uranium, tritium and americium are by far the most commonly used nuclear radiation emitters. The other

radioactive materials require similar precautions and pose similar hazards. All items of equipment emitting ionizing radiation are required to bear the standard radiation trefoil warning marker. All personnel working with trefoil marked equipment must be fully informed of the precautions and hazards. In all cases the Technical Manuals of marked equipment contain the information necessary for safe operation.

D-4. Other Sources of Information
To find out more about the health effects of radiation:
a. Contact Unit Radiation Safety Officer.
b. Consult Technical Manuals for Radioactive Commodities involved. See Appendix A for list of TMs.
c. View the following videotapes, available at Army Training Aid Support Centers:
(1) US Army Videotape, TVT 3-92, “Depleted Uranium Hazard Awareness”.
(2) US Army Videotape, TVT 3-99, “Contaminated and Damaged Equipment Management Operations”.
d. Contact the nearest AMC Logistics Assistance Representative for the item involved.
e. Contact the nearest U.S. Army Medical Department Activity or Medical Center, ATTN: Preventive Medicine Department.
f. Contact the U.S. Army Chemical School, ATTN: ATZN-CMN-B, Fort McClellan, AL 36205, telephone DSN 865-5919/4489.
g. Contact the U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: Medical Health Physics Program. Address is at Appendix E.

Appendix E

Suggestions For Commanders
Assistance With Radiological Incidents Or Contaminated Equipment

E-1. General
When a radiological incident occurs, there is sometimes confusion as to whom should be called to help resolve the concerns. The commander may not be aware of the various personnel and staff sections available to assist in the management of a radiation incident. The subject experts may be available under his/her command locally. This annex should help increase the commander’s awareness and allow for more expeditious assistance to be brought in at the time of an incident.

E-2. Local Assistance
a. Radiological incidents should be reported immediately through the chain of command to higher headquarters. Most problems experienced in the management of contamination incidents occur because of a delay in reporting the incident. After an incident, a clock begins ticking that involves:
(1) Potential exposure of personnel to radiation or radioactive materials.
(2) Damage to equipment that may get worse with time.
(3) Potential contamination of the environment that, if present, may get worse with time.
b. It is very important that radiation incidents are handled and reported as expeditiously as possible.
c. The Army uses many different items of equipment that contain radiation sources or radioactive materials. Because of this, personnel in different Military Occupational Specialties and Areas of Concentration have received varying levels of training in radiation and it’s effects. Some of these specialties are :
(1) Nuclear Medical Science Officer, e.g. 72A67

(2) Local Radiation Safety Officer (MOS/AOC immaterial)
(3) DA Civilian Health Physicists
(4) Chemical (54 series), e.g. 54B, E.
(5) Chemical officer, e.g. 74A
(6) Explosive Ordnance Disposal Specialist (e.g. 55D)
(7) Certain Engineer Personnel (users of the MC-1 or Troxler Soil Gauges)
(8) RADIAC Calibrator/Custodian Personnel, School Trained, MOS/AOC immaterial.
(9) Theater Test, Measurement, and Diagnostic Equipment Activity Personnel.
(10) Certain Medical (91 series), e.g. 91SN4, 91P
(11) Environmental Science Officer (Industrial Hygiene), e.g. 72D.
(12) Preventive Medicine Officer, e.g. 60C.
(13) Occupational Medicine Officer, e.g. 60D.
(14) Ammunition Handlers (trained in handling DU ammunition).
(15) Army Materiel Command Logistics Assistance Representatives/Officers, who are trained on the radiation characteristics of their particular commodity.
d. At first report of a radiation incident, commanders should not hesitate to draw on the above resources until outside assistance arrives. Much can be done to prevent a small incident from growing into a difficult situation, if action is taken quickly.
e. The Radiation Safety Officer (RSO) should search out these personnel and coordinate with them ahead of time to preclude an information gap with subsequent time loss in the event of an incident.
f. In the event that the incident or contamination event must be elevated beyond the immediate command, personnel with the above MOS/AOC at headquarters level can provide support, or help commanders obtain proper support.
g. The Army RADIAC equipment, both the AN/VDR-2 and the AN/PDR-77, are able to detect beta-gamma radiation levels. In addition, the AN/PDR-77 can detect alpha radiation levels and low energy x-rays.

E-3. How Local Assistance Can Help
a. Chemical personnel.
(1) Advise commander on nuclear, chemical and biological aspects/ hazards of contaminated materiel damage assessment repair, recovery and retrograde operations.
(2) Supervise completion of initial and follow up radiological surveys with tactical RADIAC instruments.
(3) Plan and supervise decontamination of equipment. Individuals selected for decontamination operations will be properly trained and made aware of the hazards associated with the radiation sources involved.
(4) Ensure that all contaminated materiel requiring retrograde has the appropriate marking and/or designation.
(5) Provide assistance to vehicle recovery and BDAR personnel in processing contaminated equipment requiring retrograde.
(6) Supervise segregation of known or suspected LLRW and mixed waste from uncontaminated items during retrograde operations.
b. Medical Support
(1) Medical Personnel
(a) Perform initial assessment of soldiers potentially exposed to radiological or mixed waste hazards.
(b) Assist with extrication of wounded soldiers from suspected or confirmed contaminated and damaged materiel.
(c) Supervise radiological patient decontamination as an integral part of medical operations (FM 3-5).

(d) Report the names of personnel (casualties and workers) exposed to DU and other radioactive and mixed waste to higher headquarters.
(2) Medical treatment facilities
(a) Perform assessment and treatment of soldiers exposed to radioactive and mixed waste materials.
(b) Perform bioassays of soldiers for radiological exposure IAW OTSG guidance.
(c) Record radiation doses in soldiers' medical records (when bioassays are processed) during surgical procedures or medical treatment IAW unit SOP. Assure bioassay results are sent to AIRDC for inclusion in the dosimetry records.
(d) Explain hazards and treatment protocols to all exposed or contaminated soldiers.
(e) Establish, operate, and maintain radiological patient decontamination stations.
(3) Preventive Medicine personnel will:
(a) Provide advice and assistance to commanders and staffs on radiological and mixed waste hazards.
(b) Provide advice to unit commanders and staffs on protective measures to be employed while processing contaminated materiel.
(c) Provide or obtain interpretation of bioassay results.
(d) Assist radiological survey teams, if needed.
(e) Ensure that uncontaminated water is available for consumption and hygiene.
c. Explosive Ordnance Disposal (EOD) Support
(1) Process suspected ordnance in support of equipment recovery/evacuation efforts.
(2) Supervise separation of contaminated from non-contaminated munitions during storage and retrograde operations.
(3) Provide awareness training on recognition of munitions hazards and handling procedures to soldiers involved in the recovery and retrograde of contaminated materiel which may contain unexploded, damaged, or spent ordnance.
d. Maintenance Support
(1) Unit Level Maintenance Support.
(a) Complete BDAR , recovery and retrograde operations IAW FM 9-43-2, TB 9-1300-278, and DA PAM 700-xx.
(b) Establish and operate a collection point for contaminated equipment awaiting repair or evacuation. Contaminated equipment should be separated from that known not to be contaminated.
(c) Coordinate the movement of contaminated equipment requiring evacuation for retrograde with transportation personnel.
(2) DS/GS level maintenance organizations:
(a) Establish and operate a collection point for contaminated materiel awaiting repair or evacuation. Contaminated equipment should be separated from that known not to be contaminated.
(b) Coordinate the movement of contaminated materiel requiring evacuation with transportation personnel.
(3) Depot Level Maintenance Support. Depot level support personnel will complete repair of decontaminated damaged materiel and return materiel to normal supply channels.

E-4. Outside Assistance
a. Radiation Surveys. If the problem is beyond the scope of the local assets, contact:
(1) Higher headquarters RSO. The RSO will arrange for other staff support, as needed.
(2) Through channels, the Army Contaminated Equipment Retrograde Team. Address in Appendix E.

b. Wipe Tests. A “wipe test”, or assay of a piece of filter paper or other acceptable media, is a primary method of confirming the presence of removable contamination or ruling it out. The test is a necessary complement to radiation surveys performed with instruments such as the AN/VDR-2 or the AN/PDR-77. Wipe tests should be taken and sent to a qualified laboratory for analysis. The RSO can advise on how to take wipe tests. Qualified Army laboratories are listed below. Before sending wipes, call ahead to the laboratory and alert the staff that wipes will be forthcoming.
(1) OCONUS, send wipe tests to:
(a) Germany/Europe Theater (Pirmasens) - Director, US Army TMDE Region-Europe, ATTN: AMSAM-TMDE-GE-PN, (CMR 434), APO AE 09138. Telephone DSN 495-6486, Comm 011-49-6331-6486.
(b) Korea Theater (Camp Carroll) - Commander, 2nd Maintenance Company (TMDE) - ATTN: AMSAM-TMDE-GP-KR (Unit 15376), APO AP 96260-0276. Telephone DSN 315-765-7698, Comm 011-82-545-9707698.
(2) CONUS, send wipes to (only one):
(a) Director, US Army TMDE Activity, ATTN: AMSAM-TMDE-SR-C, Redstone Arsenal AL 35898-5400. Telephone DSN 746-0472, Comm (205) 876-0472 FAX: DSN 746-3816, COMM: (205) 876-3816 EMAIL: howard@redstone.army.mil.
(b) Director, US Army TMDE Activity, ATTN: AMSAM-TMDE-SB, Bldg 363, Fort Belvoir, VA 22060-5847. Telephone DSN 654-1979/2807, Comm (703) 704-1979/2807, Fax: DSN 654-1979/654-2807 Comm. (703) 704-1979/2807 Email: tmikulski@belvoir.army.mil.
(c) Commander, U.S. Army Communications-Electronics Command, ATTN: AMSEL-SF-RE (Evans), Fort Monmouth, NJ 07703-5036. Telephone DSN 987-5370, Comm (908) 427-5370.
(d) Commander, Rock Island Arsenal Independent Lab, ATTN: SIORI-SEM-L,
Rock Island, IL 61299-5000. Telephone 793-7889, Comm (309) 782-7889.
(e) Commander, U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-ML-RICD, Aberdeen Proving Ground, MD 21010-5422.
Telephone is DSN 584-2619/4375, Comm (410) 671-2619/4375.
(3) Wipes should be sent inside an envelope that is inside of a second envelope. Ensure that the words “mail room, do not open” and “wipe tests” are written on one of the envelopes.
(4) Acceptable radioactive contamination levels for areas and equipment are described in Table 4.2.
c. Radioactive Commodity Assistance. For technical assistance with radioactive commodity incidents and contamination from AMC commodities after the LAR/LAO notification, contact the following, through channels, as applicable:
(1) Aviation and Troop Command (Compasses, Watches, Aviation Parts) - Commander, ATCOM, ATTN: AMSAT-R-X, St. Louis, MO 63120-1798. Telephone DSN 693-2196, Comm (314) 263-2196.
(2) Armament and Chemical Acquisition and Logistics Activity (Chemical Agent Alarms, Chemical Agent Monitors, Tritium Fire Control Devices) - Director, ACALA, ATTN: AMSTA-AC-SF, Rock Island, IL 61299-6000. Telephone DSN 793-2962/65. Comm (309) 782-2962/65.
(3) Communications-Electronics Command (RADIAC Calibrators, RADIAC Meters) - Commander, CECOM, ATTN: AMSEL-SF, Fort Monmouth, NJ 07703-5000.
Telephone DSN 987-3112, press “0”. Comm (908) 427-3112, press “0”.
(4) Industrial Operations Command (DU Ammunition, Light Antitank Weapon) - Commander, IOC, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000. Telephone DSN 793-2933, Comm (309) 782-2933.

(5) Missile Command (Missile Components, Thorium Night Vision Devices) - Commander, U.S. Army Missile Command, ATTN: AMSMI-SF, Redstone Arsenal, AL 35898-5000. Telephone DSN 746-7272, Comm (205) 876-7272.
(6) Tank Automotive Command (Wheeled, Tracked Vehicles, Soil Moisture Density Gauges) - Commander, TACOM, ATTN: AMSTA-CS-CZ, Warren, MI 48397-5000.
d. Radioactive Waste Disposal. Industrial Operations Command, Low Level Radioactive Waste Disposal Office, home base for the ACERT - Commander, IOC, ATTN: AMSIO-DMW (ACERT), Rock Island, IL 61299-6000. Telephone 793-2933, Comm (309) 782-2933. Nights/Weekends call DSN 793-6001, Comm (309) 782-6001.
e. Radiation Bioassay and other Radiation Consultations- U.S. Army Center for Health Promotion and Preventive Medicine - Commander, CHPPM, ATTN: MCHB-OIC-HI, Aberdeen Proving Ground, MD 21010-5422. Telephone DSN 584-3502/3548, Comm (410) 671-3502/3548.
f. Radiation Accident / Incident Investigation - U.S. Army Safety Center, Fort Rucker, AL 36362. Telephone. DSN 558-2539. Comm (334) 255-2539.
g. Radiation Accident Reporting - Army Operations Center, HQDA - Headquarters, Department of the Army, The Pentagon, Washington, DC 20310. Telephone DSN 227-0218, Comm (703) 697-0218.
h. Radiation Dosimetry- Director, U.S. Army TMDE Activity, ATTN: AMSAM-TMDE-SR-D, Bldg 5471, Redstone Arsenal, AL 35898-5400. DSN 746-1858, Comm (205) 876-1858 Fax: DSN 746-3816, Comm. (205) 876-3816, email: IRBD@redstone.army.mil.

Appendix F

Army Contaminated Equipment Retrograde Team

F-1. Mission

The Army Contaminated Equipment Retrograde Team (ACERT) is a standby team of individuals formed and operating under the direction of the Chief, Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command. They may be contacted by mail at: Commander,U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000. They may be contacted by phone, fax, or email at: DSN 793-2933, Comm (309) 782-2933, Facsimile DSN 793-2988 Comm Facsimile (309) 782-2988, email smapley@ria-emh2.army.mil. The Chief, Radioactive Waste Disposal Division or designate will direct the team during training or deployment. The team's mission is:
a. Provide a combat / non-combat team capable of world wide response for accidents/incidents involving the retrograde of RCE.
b. Develop and provide plans for the retrograde of contaminated equipment as required to support Army operations.
c. When deployed, act as the primary point of contact for radioactive and mixed waste materiel contamination incidents.
d. Respond to requests for assistance from major commands with contaminated equipment, and no means for disposition.
e. When requested, provide on-site assistance to commanders and Radiation Safety Officers with contaminated equipment.
f. Operate a central contaminated equipment storage and control area supporting theater operations under the direction of the Theater Commander.
g. Take possession of contaminated equipment awaiting retrograde from theater of operations.

h. Identify and request Army resources capable of responding to radioactive and mixed waste incidents.
i. As necessary, provide technical assistance on the use, storage, and disposal of radioactive and mixed waste materials as related to contaminated equipment.
j. Provide technical assistance on maintaining the health and safety of personnel handling contaminated equipment.

F-2. Composition
The composition of the team will include but is not limited to:
a. Team Chief and dedicated personnel from the Low Level Radioactive Waste Disposal Division, HQ IOC (AMSIO-DMW), providing both health physics and radioactive/mixed waste planning expertise.
b. Contractual staffs as needed to accomplish missions, based on existing contractual agreements set up by HQ, IOC.
c. Individuals, civilian and military, as designated by the commander of the unit(s) requiring assistance.
d. Other personnel as designated by HQ, AMC or Headquarters, Department of the Army.

F-3. Operation
a. The ACERT will utilize other Army assets when needed and will direct the consolidated team's activities.
b. The ACERT will coordinate response planning with other Army assets to ensure effective operations and use of Army resources.

F-4. Procedures
a. Members of the ACERT will remain ready to deploy on short notice to incidents involving radioactive material and mixed waste contamination after notification from higher headquarters. These include but are not limited to:
(1) Combat situations involving wheel or tracked vehicles and accidents/incidents involving depleted uranium contamination and radioactive commodities.
(2) Non-combat:
(a) Fires/incidents/accidents involving wheel or tracked vehicles, where the presence of radioactive materials or mixed waste has been confirmed.
(b) Accidents involving fire control devices, chemical agent detectors/monitors, and soil moisture density testers or other radioactive commodities where the likelihood of radioactive contamination has been confirmed.
(c) Any storage or transportation incident or accident in which ammunition containing deplete uranium has been involved.
(d) Structural incidents (buildings, warehouses, etc) in which radioactive materials or mixed waste are involved.
b. The ACERT will maintain adequate equipment and supplies through prepositioned storage to sustain operations until additional materials are deployed to the site.
c. The ACERT members will be trained to handle contamination of all types of Army equipment. Team members will receive initial and periodic refresher radiation safety and response training.
d. Upon deployment, the ACERT Team Chief will assume control of the team. Upon arrival at the deployment site, the Team Chief will:
(1) Report to the commander of the unit requesting the team's services for a situation briefing and to brief him or her on the team's capabilities. After assessment of the situation, the Team Chief will augment the team with unit personnel and equipment, as available.
(2) Provide assistance according to the team's established procedures.

(3) Set up coordination and communication with higher headquarters (HQ, AMC) and ensure that an open line of communication continues to exist throughout the mission.
(4) Request other accident response assets (RADCON Team, RAMT, other available assets) as needed to accomplish the mission.
(5) Communicate as needed with federal, state or host nation officials as the mission progresses.

Appendix G

SUGGESTED SUPPLIES

G-1. Purpose. The annex identifies supplies to have on hand in order to manage items contaminated with DU/LLRW. These items are not all inclusive and may be substituted for as supply levels and conditions allow. Where available, National Stock Numbers are listed to assist with ordering.

G-2. Equipment.

ITEM NSN NOTES
Radiac meter AN VDR2 6665-01-222-1425
Radiac meter AN PDR 77 with RPO kit 6665-01-347-6100
Vacuum with High-Efficiency Particulate filter Local procurement
Spade shovels 5120-00-293-2516
Scoop shovels 5120-00-188-8446
Pick 5120-00-194-9458
Shears 5130-00-595-9734
Scissors 5110-00-162-2202
Tongs 7330-00-616-0997
Screw drivers 5120-00-357-7175
or 5120-00-103-9743
Wrench Set, Metric 5120-00-176-1819
Wrench Set, SAE 5120-00-148-7917
Socket Set, Metric Socket Set 5120-00-935-7315
Socket Set, SAE Socket Set 5120-00-322-6231
Hammer, Sledge 5120-00-224-4139
Hammer, Carpenters 5120-00-892-5485
Hammer, 5 lb hammer 5120-00-900-6095
100 lb hammer 5120-00-900-6097
Knife, Pocket 5110-00-240-5943
Knife, Survival 5110-01-321-8805
Pry bar 5120-00-224-1389
Milvan 5120-00-224-1384

G-3. Supplies
a. Protective Clothing.
Coveralls, Anti-c’s Local Procurement

Gloves, Leather 8415-01-134-8233
Gloves, NBC protective 8415-01-033-3517 to 3520
Gloves, Surgical Local Procurement
G-3. Supplies (continued)
Covers, Helmet, CP 8415-01-111-9026
Covers, Footwear, CP 8430-01-021-5978
Goggles 7240-00-052-8776
Mask, Protective, (M17 or M40 series M17 4240-00-542-4452 Check Unit TO&E or equivalent) M40 4240-01-255-0063 “
Overgarment, Battle Dress 8415-01-327-5346 to 5353 “
Boots, Leather Local Procurement “
Face Shield 4240-00-542-2048

b. First Aid
91B medical aid bag or equivalent Local Procurement “
c. Posting/Marking
Rope 4020-00-960-1356
NBC marking set 9905-01-346-4716
Radiation labels 9905-12-132-2579
UXO signs Local Procurement
d. Radiobioassay
Swabs, Cotton Local Procurement
Bottle, Polyethylene “ “
Bags, Plastic, Zip-lock 8105-00-837-7757
Swipes Local Procurement
Envelopes 8105-00-290-0330
Tweezers 5120-00-542-2348
Forceps 5120-00-012-4013
e. Decontamination
Soap, Hand 8520-00-228-0598
Cleanser 7930-01-346-4289
Gauze Local procurement
Towel, Paper 8540-01-169-9010
Cotton balls Local procurement
Hand cream Local procurement
Pail, Metal, 14 qt 7240-00-160-0455
Can, Galvanized, 32 gal 7240-00-160-0440
Brush, Long Handle 7920-00-141-5452
Sponge, Heavy duty 7920-00-884-1116
Buckets Local procurement
f. Radioactive Waste Disposal
Drum, 30 gallon / 55 gallon drums with lids 8110-00-030-7780
Bag, Plastic, 55 gallon, 4 mil 8105-00-655-8286
Bottles, Plastic Local Procurement

g. Miscellaneous
Paper tablet 7510-00-823-8072
100 mile/ hr tape 7510-00-823-8072
Masking tape 7510-00-266-6710
Tape, Duct 5640-00-103-2254
Pencils, Graphite 7510-00-286-5755
Pencils, Grease 7510-00-240-1525 or -1526
Pens, Marking Local Procurement
Pens, Writing 7520-01-357-6841
Log books 7530-00-222-3525
and 7520-00-286-8363
Camera with film Local Purchase
Tarpaulin, Canvas 8340-00-205-3325
Tarpaulin, Plastic (griffolyn) Local Procurement

Appendix H

Decontamination Techniques And Methods-Personnel And Equipment

H-1. General Decontamination Procedure

The specific decontamination methods and procedures selected for use in particular circumstances depend on the type, extent, and location of the contamination; however, the general approach to decontamination outlined below applies to most situations:
a. Decontamination should always be performed under the direction of radiation safety personnel.
b. Access to contaminated areas must be controlled.
c. Provide personnel protection, including appropriate clothing, for workers.
d. Evaluate what is to be decontaminated.
e. Obtain necessary equipment and materials (Appendix E).
f. Survey all items to be released to an unrestricted area.
g. Begin with the mildest decontamination method and progress to harsher, more abrasive, or caustic methods as required.
h. Work from the outside of the contaminated area to the inside.
i. Isolate all clean areas from contaminated areas. Clean areas adjacent to those being decontaminated should be covered with taped down paper, plastic, or other disposable material to prevent recontamination.
j. Minimize the generation of contaminated liquids and airborne radioactivity during the work, and collect and treat as contaminated waste all liquids generated and materials used during decontamination operations.
k. Survey between major steps in the decontamination process (i.e., between successive applications of each technique and between different techniques).
l. Continue decontamination until contamination levels are reduced to appropriate levels, as given in Appendix J.
m. Document the completion of decontamination, including the name of the individual performing the final survey, the date, and the survey results.

H-2. Personnel Decontamination

Before external decontamination of an individual is begun, the following steps should be taken to help establish priorities for decontamination and follow-up effort:

a. Observe any physical effects on the contaminated person, such as bleeding, irregular breathing rate, burns, or shock.

b. Assess the extent of any injuries. Medical treatment of injuries takes priority over decontamination.

c. Determine the extent and magnitude of contamination using personnel survey techniques.

d. Document survey results (Appendix I).

e. Remove contaminated clothing, place it in a plastic bag, and hold it for further disposition.

f. Obtain assistance from medical personnel if decontamination of eyes, ears, nose, or mouth is necessary.

g. Personnel should be decontaminated as quickly as possible using the least drastic means necessary.

h. Decontamination methods should begin with mild methods, which should be continued as long as they are effective, and progress to harsher methods, only as required.

i. Extreme care should be taken to prevent the spread of contamination to any skin or body opening.

j. All liquids generated and materials used during decontamination should be collected and treated as contaminated waste.

k. Personnel performing the decontamination should take all necessary precautions to protect themselves.

l. Cool or lukewarm water should be used for all washing and rinsing. Hot water causes the skin pores to open, driving contamination deeper into the skin, cold water closes the pores, trapping contamination in the skin.

H-3. Specific Personnel Decontamination Methods

a. Thorough washing with nonabrasive soap and lukewarm water is the best general method of decontamination of the hands and other parts of the body. If the contaminant is localized, it is often more practical to mask off the affected area, and cleanse with swabs, rather than risk the danger of spreading the contaminant by general washing. Organic solvents must be avoided as decontaminating agents, because they may increase the probability of the radioactive materials penetrating through the pores of the skin. Special attention must be given to the areas between the fingers and around the nails. The outer edges of the hands are readily contaminated, and must not be neglected in the washing.

b. After repeated washings, the skin may tend to chap. To avoid this, apply lanolin or hand cream and then continue to wash. If repeated washing with soap and water is unsuccessful in the personnel decontamination, the individual should be referred to the local medical officer for application of the more drastic chemical decontamination.

c. In the event several individuals have become contaminated, or the contamination on an individual is not localized to a small portion of the body, the following decontamination procedure is recommended:

(1) Place individual in a lukewarm shower.

(2) Using a mild soap, individual should cover entire body with lather.

(3) While still covered with lather, individual should step out of shower.

(4) Sprinkle a heavy coat of mild soap flakes all over lathered individual (purpose of lather is to cause soap flakes to adhere to person).

(5) Using his hands, the contaminated individual should rub the soap flakes on his body into a paste.

(6) Individual should then return to shower and rinse soap off his person by starting at the top and working his way down. NOTE: It will be necessary for individual to rub body surfaces with his hands while rinsing In order to remove soap paste. Soap paste will remain on those areas which have not been thoroughly washed. Although a soft cloth may be used, a brush may not. Particular attention should be given to hairy portions of the body.
(7) When the individual has rinsed himself to the point that he no longer feels slimy, and while still under shower, he should be examined by an assistant for traces of soap. The presence of soap will indicate which areas of the body have not been decontaminated.
(8) After removing all traces of soap, individual should leave the shower and dry
(9) After drying off, individual must be monitored. If still contaminated, above procedures should be repeated. In the event residual contamination is localized, repeat procedures should be limited to those areas still showing contamination.
d. In all cases of personnel contamination, the RPO must be consulted. If ingestion or inhalation of radioactive material is suspected, bioassays should be performed.

H-4 . Equipment And Material Decontamination
Materials that cannot be easily or cost-effectively decontaminated should be evaluated for possible disposal as radioactive waste. Porous items (such as wood, paper, cloth), intricately-designed equipment, and items of low replacement cost tend to fall in this category. If decontamination of equipment and/or materials is required, many cleaning, abrasive, chemical, and electrochemical methods are available. Listed here are a few of the simpler and least costly methods. These methods should be repeated until surveys indicate the need for harsher method. Under no circumstances will dry sweeping of radioactive contamination be allowed. Appropriate PPE must be worn.
a. Use masking, adhesive, friction, or duct tape, place over the contaminated area, remove, and discard as radioactive waste.
b. Use vacuum-cleaning techniques with a conventional wet or dry vacuum cleaner modified to include a High-Efficiency Particulate Air (HEPA) filter on the exhaust. Dispose of bag or collection container as radioactive waste. Respiratory protection must be used. If a HEPA filter is not available, do not vacuum.
c. Wipe or wet mop, using a decontaminating agent or detergents and hot water. NOTE: For tank fires: If the above methods do not completely decontaminate the exterior of the tank, contamination should be considered fixed and the tank should be transported to a Army facility before harsher methods are used.
d. Contaminated soil around accident and water runoff should be scraped up and containerized for removal as radioactive waste.

Appendix I

SURVEY/DECONTAMINATION RECORDS

I-1. PERSONNEL CONTAMINATION RECORD.

a. Essential Information.

Patient Name:_____Social Security Number:_____

Date Of Incident:_____ Time Of Occurrence: _____

Location Of Incident:_____
Grid Coordinates, if known:_____

Cause of Contamination:_____
_____
_____
_____
_____

When Was Contamination Discovered?_____

b. Survey Results.

Survey Performed By:_____
Unit:_____

Survey Instrument Manufacturer _____
Serial Number:_____ Probe Type:_____
Calibration Expiration date_____
Indicate type, extent, and magnitude of contamination below on a sketch of a human figure.

I-2. RECORD OF AREA/EQUIPMENT SURVEY.

Date Of Incident:_____ Time Of Occurrence:_____

Location Of Incident:_____
Grid Coordinates, if known:_____

Cause of Contamination:_____
_____
_____
_____
_____

When Was Contamination Discovered?_____

Equipment Nomenclature NSN ICRIS?

_____

_____

_____

_____

_____

b. Survey Results.

Survey Performed By:_____
Unit:_____

Survey Instrument Manufacturer And
Serial Number:_____ Probe Type:_____
Calibration Date:_____

Results within release limits? (See Appendix J)

Appendix J

RECOMMENDED MAXIMUM FREE RELEASE LIMITS FOR RADIOACTIVE CONTAMINATION

SURFACE RADIOACTIVITY VALUES[1,2] IN DPM/100 CM^2

Nuclide	Removable[2,3]	Total (Fixed + Removable)[2,4]
U-nat, U-235, U-238, and associated decay products	1,000	5,000
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above[5]	1,000	5,000
Tritium organic compound; surface contaminated by HT, HTO, and metal tritide aerosols	10,000	10,000

[1]From 10 CFR 835, appendix D. The values in this table apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and

beta-gamma-emitting nuclides exists, apply the limits established for alpha- and beta-gamma-emitting nuclides independently.
[2]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
[3]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with a dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and Ra-228, Ac-227, Th-228, Pa-231 and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
[4]The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm^2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide , if: (1) From measurements of a representative number n of sections it is determined that $\frac{1}{n}\sum_{i=1}^{n} S_i \geq G_i$, where S_i is the dpm/100 cm^2 determined from measurement of section I; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm^2 area exceeds 3G.
[5]This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Appendix K

Radioactive Commodities Contamination Concerns

K-1. General
Source rupture is bad - typical of total destruction of the item or if the item is on fire.

K-2. Tritium Commodities
Outdoors, continue with the mission but double-bag & tag (handle with appropriate licensed care) ASAP.
Indoors, it is a problem. Risk is essentially internal only.

K-3. Contamination from DU munitions (Combat vehicles damaged by DU fire or combat vehicles containing DU armor that have been damaged in any way)
Always a problem. Risk is primarily from internal exposure.

K-4. M8A1/CAM/CAD (Am-241/Ni-63).
Any form of physical damage is a problem. Risk is primarily from internal exposure.

K-5. MC1 Soil Moisture Density Tester (Cs-137 & Pu/Be)

Any form of physical damage is a problem. Risk is primarily from an external exposure but if the integrity of the source has been breached (from total destruction or burning, not from minimal physical damage), then a significant internal problem in addition to an external exposure problem.

K-6. AN/UDM-2 (Sr/Y-90) and AN/UDM-6 (Pu)
Any form of physical damage, it is a problem. Risk is primarily from internal exposure.

K-7. Night Vision Devices (Th-232)
Any evidence of "flaking" from the coated glass or physical damage to the glass is a problem. Risk is primarily from internal exposure.

K-8. Foreign Equipment.
See Chapter 6 for specific details.