DEPARTMENT OF THE ARMY
DEVENS RESERVE FORCES TRAINING AREA
Devens, Massachusetts 01433-5000

SAFETY
CONTROL OF IONIZING RADIATION

SUMMARY. This memorandum outlines responsibilities and procedures for control of radioactive material and protection of personnel from ionizing radiation hazards.

APPLICABILITY. Applies to all units and activities in the Devens Reserve Forces Training Area having or using radioactive material/equipment.

IMPACT ON NEW MANNING SYSTEM. This memorandum does not contain information that affects the New Manning System.

SUGGEST IMPROVEMENTS. The proponent of this memorandum is the Safety Management Office. Users are invited to send comments and suggested improvements on DA Form 2028, Recommended Changes to Publications and Blank Forms, directly to the Commander, Devens Reserve Forces Training Area, ATTN: AFRC-FMD-SO, Devens, MA 01433-5520.

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1. References. Reference publications are listed in appendix S.

2. Responsibilities.

a. The Safety Management Office has overall responsibility for control of and protection from ionizing radiation hazards. The SMO will exercise staff supervision through the installation Radiological Protection Officer (RPO) who will:

(1) Ensure the safety of all operations involving the use, storage, transportation, and maintenance of equipment containing ionizing radiation sources, and adhere to the philosophy of

"ALARA" (i.e., keeping exposure to the harmful effects of ionizing radiation to a level that is "as low as reasonably achievable.")

(2) Establish radiation areas and ensure proper posting of warnings on existing or potential radiation hazards.

(3) Establish and monitor protective measures and procedures for controlling exposure of occupationally exposed personnel, including the administration of the film badge and dosimetry services.

(4) Provide guidance, technical information, and assistance to the installation staff, units and activities on radiological hazards and protective measures.

(5) Conduct surveys of established radiation areas to ensure the adequacy of physical security and safeguards for the control and protection of personnel from ionizing radiation.

(6) Approve the requirements and provide required certification for requisition of controlled radioactive items.

(7) Maintain a current roster of all employees on the film badge program.

(8) Conduct investigations and prepare reports on all incidents involving the loss of radioactive materials or sources, overexposure of personnel, contamination, and all related radiation hazards.

(9) Review qualifications and exercise approval authority for certification of the local RPOs for the units and activities within this command.

(10) In conjunction with the Director of Logistics (DOL) RPO, the installation RPO will also:

(a) Approve all requests for the transfer or disposal of radioactive materials.

(b) Establish procedures for the preparation of radioactive materials for shipment, including processing, packaging, labeling, and shipper's documentation required by the Department of the Army (DA), and the Department of Transportation (DOT). (DOT regulations are included in Title 49 CFR.)

(c) Prepare all requests for movement and/or shipment of radioactive materials and provide the installation Transportation Officer with the required certification of contents, packaging, radiation levels, and documentation for compliance with DA and DOT regulations.

(d) Establish procedures for monitoring incoming shipments of radioactive materials to minimize the exposure of supply, transportation, and other receiving personnel to preclude or limit contamination from damaged shipping containers.

(e) Establish procedures for the collection, receipt, control, storage, and disposal of unwanted and unserviceable radioactive materials.

b. The Director of Logistics will provide a qualified individual to function as the DOL RPO. The DOL RPO will:

(1) Supervise radioactive material operations within the DOL organization (see paragraph 2d, 2e) and perform those installation RPO functions necessary for the continuity of DOL operations during the absence of the installation RPO.

(2) Forward all requests for movement and/or shipment of radioactive materials to the installation RPO for certification after ensuring that the contents, packaging, radiation levels, and documentation meet DA and DOT regulations.

(3) Ensure that the installation RPO has a copy of the DOL RPO's appointment and qualifications.

(4) Conduct a 100% inventory of all radioactive sources stored on the installation and update this inventory as changes in storage areas occur. Coordinate with the radiation testing and tracking system coordinator to ensure the accuracy of the inventory.

c. The Chief of the Test, Measurement, and Diagnostic Equipment (TMDE) Support Center will:

(1) Appoint a qualified individual to function as the TMDE RPO.

(2) Provide maintenance services for test and calibration sources, including leak testing and shipment to depot for periodic calibration maintenance.

(3) Provide training for unit personnel in Radiation, Detection, Indication, and Computation (RADIAC) calibration procedures and safe practices.

(4) Notify the installation RPO immediately of any suspected leaks in calibration or RADIAC test sources.

d. The DOL Supply and Services Division's installation Supply Officer will:

(1) Ensure that personnel at the supply receiving points are aware of the potential radiation hazards and are familiar with the standard warning signs and labels used to identify radioactive commodities in transit.

(2) Maintain a complete receiving system for incoming radioactive materials at a central receiving point and shipping section.

(3) Notify both the installation RPO and the DOL RPO of all individually controlled items received and turned-in. Controlled items will not be moved from the shipping section or the central receiving point prior to inspection and approval by the installation RPO and the DOL RPO. The individually controlled items are identified in AR 385-11, table 3-1.

(4) Operate the installation's radioactive material control point for the collection, processing, storage, and preparation of radioactive materials in excess of type A quantities for shipment. (See Title 49 of the Code of Federal Regulations, part 173, section 411 - [49 CFR 173.411].)

(5) Ensure the delivery of unserviceable and non-controlled radioactive commodities to the installation's radioactive material control point, pending disposal.

(6) Notify the installation RPO, the DOL RPO, and the installation Transportation Officer immediately of the arrival of any shipment bearing radioactive warning labels. Such shipments will not be opened or moved from any receiving point until monitored for radiation and cleared by the installation RPO or DOL RPO. In compliance with 10 CFR 20, incoming shipments of radioactive materials should be inspected at the time of arrival, and in no case will inspection be delayed for more than three hours after receipt during duty hours, or 18 hours during non-duty hours.

(7) Provide the installation RPO with an annual listing of all known radioactive items in excess of 10 CFR 30.71, schedule B, on this installation.

(8) Incorporate the previous procedures into written instructions in coordination with the installation RPO.

e. The DOL Transportation Division's installation Transportation Officer will:

(1) Notify the installation RPO of all incoming shipments of radioactive materials as far in advance as possible.

(2) After notification of an incoming shipment of radioactive material, coordinate with the local commercial carrier, the consignee, and the installation RPO and/or DOL RPO to attempt to arrange for a specific time and delivery point so the shipment can be inspected and monitored for radiation on its arrival in compliance with 10 CFR 20.

(a) Delivery arrangements should be accomplished as soon as practical after arrival of shipment at the local commercial carrier's facility, preferably within three hours.

(b) Shipments arriving at the consignee's facility should be inspected and monitored by the installation RPO and/or the DOL RPO at the time of delivery, but in no case should this be delayed more than three hours after receipt during duty hours or 18 hours after receipt during non-duty hours.

f. Commanders/supervisors of units/activities that use, store, or handle individually controlled item radioactive calibration and test equipment will appoint a local RPO and establish and maintain a unit/activity radiation protection program in compliance with procedures contained in appendix A.

g. Commanders/supervisors of units/activities that use, store, or handle radioactive equipment or operate ionizing radiation producing devices will register this equipment or devices with the installation RPO and establish dosimetry services as directed by the installation RPO.

3. Leak Tests and Calibration Procedures.

a. Leak tests will be performed in the presence of the installation RPO, the DOL RPO, or the TMDE RPO. The RPO present during testing will furnish copies of the leak test reports and results of the laboratory analysis to the unit or activity having custody of the item tested.

b. Units/activities possessing radioactive sources requiring periodic calibration will, on notification by the TMDE or the DOL Material Maintenance Division (MMD), turn-in the items either to the TMDE Support Center or the DOL MMD for shipment to the appropriate Army depot.

4. Removal of Radioactive Sources. Except in emergencies, controlled item radioactive sources will not be loaned, transferred, or removed from authorized storage and use areas without prior approval of the installation RPO.

5. Unwanted Radioactive Materials. Unwanted, unserviceable radioactive materials and waste will be identified and disposed of as follows:

a. Items requiring disposal as radioactive material may be identified through the following references:

(1) TB 43-0116.

(2) TB 43-0141.

(3) TB 43-0122.

(4) TB 43-0197.

(5) By the radiation warning symbols or labels on the items themselves.

(6) By contacting the installation RPO for assistance.

b. Storage.

(1) Activities generating or accumulating expendable radioactive material, including waste, will store these materials in covered steel drums with leakproof plastic linings. The steel drum containers will be painted yellow and conspicuously marked with radiation symbols and stenciled “CAUTION RADIOACTIVE MATERIAL.”

(2) Only low level, noncombustible solid waste may be stored outside the radioactive material control point (RMCP). Notify the installation RPO for disposition of materials that are liquid, gaseous, or combustible.

(3) Waste collection containers will be checked periodically to ensure that radiation levels are less than two millirads per hour at the surface and that containers are free from surface contamination.

(4) Controlled items and any item or component suspected of leaking, flaking, or contamination, will not be turned-in without prior inspection by the installation RPO.

(5) Radioactive medical items will be handled through the medical supply channel.

6. Thermoluminescent Dosimetry (TLD) Film Badge Services.

a. Unit commanders/activity supervisors will designate a local RPO for issue and turn-in of TLD film badges. The local RPOs will be responsible for control of film badges within their units and activities in compliance with schedule provided by the U.S. Army Ionizing Radiation Dosimetry Center. The local RPOs will provide copies of all dosimetry reports to the installation RPO.

b. Initiating Service. Unit commanders/activity supervisors will submit a written request to the Safety Management Office, ATTN: Installation RPO. This request will contain name, rank, and SSN of individual prior to placement on TLD film badge program. In addition, requests will state specific radiation duties to be performed, that the individual has been trained for these duties, and the name of the local RPO at the requesting unit or activity responsible for the TLD film badge service.

c. Terminating Service. Unit commanders/activity supervisors will notify the installation RPO in writing when the TLD film badge service is no longer required for each individual. Written notification will be submitted 30 days in advance and include the reason for termination. The installation RPO will contact the local RPO with termination procedures within five days after receipt of written notification.

d. The TLD Film Badge Program. The installation RPO will be responsible for monitoring the TLD film badge program in compliance with the references listed in appendix S. Questions concerning the TLD film badge program will be directed to the installation RPO.

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Appendix A

Unit Radiological Protection Program

A-1. This appendix is provided to assist commanders, supervisors, and local RPOs in establishing and evaluating a unit-level radiation protection program. The subject matter contained here is general in nature and intended to be used as a guide. Detailed procedures and requirements should be derived from and kept current with applicable references listed in appendix S.

A-2. Commanders/supervisors of units/activities that use, store, or handle controlled item radioactive sources will:

a. Establish a program for control and protection of personnel from ionizing radiation hazards.

b. Appoint in writing a qualified local Radiological Protection Officer (RPO) to supervise the radiation protection program and forward these appointments listing the individual's qualifications to the installation RPO for approval and certification. The minimum local RPO qualifications are specified in the technical manual (TM) or bulletin (TB) covering the particular radioactive source to be used. Due to the strict custodial, operational, and supervisory requirements on calibration sources, the installation RPO will be notified as far in advance as practicable concerning transfer or extended absence of the local unit RPO.

c. Ensure control of occupational exposure through film badge procedures listed in appendix I.

d. Publish standing operating procedures (SPOs) covering relative radiation safety information:

(1) Instructions to workers on safety precautions and inherent radiation hazards.

(2) Procedures for storage, handling, and the use of radioactive sources.

(3) Storage and physical security precautions.

(4) Procedures to prevent unauthorized or accidental access.

(5) Directions for removal from storage, handling, and movement to and from the work area.

(6) Operating instructions.

(7) Emergency procedures and notifications.

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(8) Limitations on the inspection, maintenance, and transfer of custody.

(9) Availability and use of monitoring devices.

(10) Instructions for the wear, storage, and exchange of film badges.

(11) Program for individual training.

(12) Restrictions on the presence of non-occupationally exposed personnel in a radiation controlled area.

(13) Procedures for emergencies in cases of:

(a) Fire, explosion, or other disaster.

(b) Break-in, evidence of unauthorized handling, tampering, loss, removal, or other unusual incidents.

(c) Suspected overexposure.

e. Ensure availability of current TMs and TBs and other regulations applicable to the radioactive source(s) on-hand.

f. Ensure maintenance of the following records:

(1) Local unit RPO qualifications, approval, and certification.

(2) The TLD film badge program current roster.

(3) Instructions to workers on safety precautions and hazards.

(4) Accomplishment of required training.

(5) Radiation surveys, leak tests, and inventories.

g. Ensure monthly surveys are conducted in accordance with appendix L.

A-3. Radiation Control Committee (RCC). The installation RPO will establish and appoint in writing an RCC as directed by AR 40-14. They will be trained annually by the installation RPO in radiation safety. The appointees will:

a. Be the advisory body to the Devens RFTA commander.

b. Establish local procedures.

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c. Review proposals, study reports of accidents/incidents and any adverse findings, and make recommendations.

d. Conduct semi-annual meeting.

A-4. The RCC will include the following representatives for the installation:

a. The installation RPO.

b. Local RPOs from the Directorate of Logistics (DOL) and the Test, Measurement, and Diagnostic Equipment (TMDE) Support Center.

c. Fire Department.

d. Safety Management Office.

e. Environmental Management Division, DPW.

f. Supply and Services Division (S&S DIV. DOL).

g. Material Maintenance Division (MMD, DOL).

h. Directorate of Public Works.

i. National Association of Government Employees.

j. 94th Regional Support Command.

k. Regional Training Site - Maintenance (RTS-Maint).

1. Legal Advisors Office.

m. Natick Labs, Occupational Health Clinic.

n. Regional Training Site - Medical (RTS-Med).

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Appendix B

Standing Operating Procedures for RADIAC Calibration Operations

B-1. General. Calibration of RADIAC instruments using the AN/UDM-2 and AN/UDM-6 sources will be confined to the established and posted radiation controlled area (RADIAC Room).

B-2. Access and Security.

a. Unsupervised access to the RADIAC Room will be limited to the installation RPO, the TMDE Support Center RPO, and those operators of the AN/UDM-2s and AN/UDM-6s who have been certified as approved users by the TMDE Support Center RPO. The TMDE Support Center RPO will supervise access to this area.

b. The RADIAC Room will be locked when not in use. A visual exterior security check will be made at the beginning of each duty day. Any evidence of unauthorized entry or attempted entry will be reported immediately to the Provost Marshal Office desk sergeant and the installation RPO.

B-3. Radiological Safety. The following general safety precautions will be adhered to within the RADIAC Room.

a. The area will be designated as radiation controlled and posted IAW AR 385-30.

b. Occupationally exposed personnel will wear their whole body film badges at all times in the controlled area.

c. Access by non-occupationally exposed personnel will be restricted in time and proximity to radioactive sources so that exposure will not exceed established radiation protection standards under AR 40-14, paragraph 6a (6).

d. Storage or use of food, beverages, tobacco, and cosmetics is prohibited.

e. Wash hands thoroughly after use or handling calibrators or any other device containing radioactive material.

B-4. Emergencies. The primary concern in emergency situations is always the protection of personnel from injury and overexposure to radiation.

a. Contamination. Leaking of sealed sources and manufactured devices can result in serious contamination of work areas. If this occurs or is suspected:

(1) Evacuate and lock RADIAC Room.

(2) Thoroughly wash hands and monitor hands and clothing with appropriate radiacmeter and ultraviolet (UV) light if applicable.

(1) Evacuate and lock RADIAC Room.

(2) Thoroughly wash hands and monitor hands and clothing with appropriate radiacmeter and ultraviolet (UV) light if applicable.

(3) Notify installation RPO.

(4) Do not enter or use the area until determined safe by thorough survey and wipe tests.

b. Fire, explosion, earthquake, or other disaster.

(1) Evacuate and lock RADIAC Room.

(2) Notify the Fire Department and the installation RPO.

(3) If time permits, remove radioactive sources to a safe place.

(4) Advise firefighters of location of radioactive sources.

(5) Do not re-enter radiation controlled area until monitored and determined safe by the installation RPO.

Appendix C

Instructions to Personnel Occupationally Exposed to Ionizing Radiation from AN/UDM-2 and AN/UDM-6 Calibrators

C-1. General.

a. References require that all individuals working in or frequenting a radiation area be informed of the existence and nature of the radiation, warned of the potential hazards, and instructed in precautions and procedures for minimizing exposure. The following information constitutes such instruction for occupationally exposed personnel on the Devens Reserve Forces Training Area.

b. Nuclear radiation consists of invisible particles and rays of energy spontaneously emitted by radioactive substances such as radium, or produced by a device such as an x-ray machine. This type of radiation is called "ionizing" and can be harmful to the human body when it is absorbed in amounts beyond established safety standards. The complex chemical changes caused by ionization can permanently affect the function of living cells and their ability to grow and reproduce. Serious effects include the reduced production of blood cells by the bone marrow, leading to leukemia. Extensive cell damage from radiation can result in serious illness - even death.

c. You should keep in mind at all times the extremely insidious nature of nuclear radiation, specifically:

(1) It is not detectable by human senses - you cannot feel it, hear it, smell it, or see it - even in massive doses. You must not let this lull you into a false sense of security or complacency toward safety procedures.

(2) The effects are cumulative and irreversible. Do not risk exceeding the allowable safe dosages. The results of cell/tissue damage may not be immediately evident and the long-term effects are not readily predictable. You should always minimize your exposure, regardless of any current sense of well-being.

d. The following may cause injury to the human body:

(1) Overexposure to Beta/Gamma Rays. This simply results from being too close or too long in the radiation field of the source. As a radiation worker, you will be protected from exposure to ionizing radiation in dangerous amounts. Your exposure will be continuously monitored by a film badge. Complete records of your monthly and accumulated lifetime dosages are maintained and monitored by the RPO to ensure that your exposure is kept to within safe limits as established in AR 40-14 and 10 CFR 20. These documents and your records of exposure (DD Form 1141) are available for your review any time.

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(2) Internal Exposure. This may be brought about by swallowing, inhaling, or absorbing radioactive substances used in calibrators. Although these substances are contained in sealed capsules, the capsules may leak due to damage, corrosion, or faulty manufacture, thereby creating spreadable contamination. To prevent such potential hazards, calibrator sealed sources are required to be leak tested periodically. Additionally, you are cautioned not to smoke, drink, eat, or apply makeup in radiation controlled areas and not to come in contact with potentially contaminated areas when you have open cuts or abrasions on your skin. Thoroughly washing hands when leaving radiation controlled areas is an obviously important precaution.

C-2. AN/UDM-2 RADIAC Calibrators. Accurate calibration of beta/gamma RADIAC instruments requires the use of a relatively strong radioactive source. The AN/UDM-2 contains 180.03 millicuries of Strontium-Yttrium (Sr-Y90) in five separate sealed capsules. Sr-Y90 emits beta particles consisting of very high velocity ionizing electrons. Beta particles can penetrate the human skin and damage living cells. In addition, secondary gamma radiation (Brem) is produced by the interaction of beta within the metal case. Properly used, the AN/UDM-2 has adequate shielding and a built-in mechanical safety feature to protect the operator from radiation in harmful amounts. However, overexposure and serious injury can result from misuse, carelessness, and neglect of safe operating procedures. It is extremely important that you follow the operating procedures in TM 11-6665-227-12 and your local SOPS. The more important precautions for the use and handling of the AN/UDM-2 are repeated here for emphasis:

a. Wear your whole body badge at all times in the radiation controlled area and always wear the wrist badge when operating the calibrator.

b. Never look directly into the access hole when the swivel cover is open - serious eye damage can result.

c. Never place the hands or any part of the body in the direct rays emanating from the access hole.

d. Never probe the access hole with sharp or pointed objects.

e. Never disassemble the rate meter or discharge the well assembly.

f. Do not eat, drink, or smoke when using or handling the calibrators. After use or handling, wash hands thoroughly and monitor with an AN/PDR-27.

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C-3. AN/UDM-6 RADIAC Calibrators. The AN/UDM-6 contains 1.4 microcuries of Plutonium (Pu-239), an emitter used to calibrate alpha measuring RADIAC instruments. Pu-239 is an extremely dangerous internal hazard. Very small amounts ingested, inhaled, or absorbed in open cuts can cause serious injury or death. It is extremely important that you follow the procedures in TM 11-6665-248-10 and your local SOPS. The more important precautions are repeated here for emphasis:

a. Do not touch the radioactive sources attached to the jigs or remove jigs from the case.

b. Do not eat, drink, or smoke while using or handling the calibrator.

c. Always wash hands thoroughly after handling the calibrator and monitor with a low-level alpha radiacmeter for contamination. Repeat as required.

d. Handle the calibrator carefully; dropping or deforming it can cause the Pu-239 to flake off and contaminate hands, tools, work areas, etc.

C-4. References.

a. AR 40-14.

b. Title 10 CFR 20.

c. Title 10 CFR 20.206.

d. TM 11-6665-227-12.

e. TM 11-6665-248-10.

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Appendix D

Standing Operating Procedures for Storage, Handling, and Operation of the AN/UDM-2 Calibrator

D-1. Storage. The AN/ UDM-2s will be stored in the established radiation area (RADIAC Room). This storage area will be locked and access will be controlled by the TMDE Support Center RPO, who will ensure that:

a. The AN/UDM-2 calibrator is stored in the lead shielded enclosure and spares or components in the steel drum provided for this purpose. Radiation levels at the outer surface of these containers should not exceed 0.5 millirads per hour.

b. Only one AN/UDM-2 is utilized in this area.

c. Only authorized, qualified personnel are permitted to remove the AN/UDM-2s from their storage containers.

d. Personnel will comply with storage/work area provisions of TB 11-6665-227-12, paragraph 10.

D-2. Operation. The TMDE Support Center RPO will supervise all AN/UDM-2 use and handling and will ensure that:

a. The AN/UDM-2 operators have received training required by TB 11-6665-227-12, paragraph 9c, and have been approved as operators/users.

b. Personnel wear both the whole body and wrist badges during calibration operations.

c. Operating and maintenance instructions in TM 11-6665-227-12 are standard unit operating procedures for the AN/UDM-2 calibrator. The following important precautions are repeated here for emphasis:

(1) Never look directly into the access hole when the swivel cover is open - serious eye damage can result.

(2) Never allow the hands or any part of the body in the direct beta rays emanating from the access hole.

(3) Never probe the access hole with sharp or pointed objects.

(4) Never attempt to disassemble the rate meter or discharge the well assembly.

(5) Never eat, drink, or smoke when using the calibrator; wash hands thoroughly after use or handling.

d. Leak tests are conducted as directed by the U.S. Army Communications-Electronics Command (CECOM) and performed by or under the direct supervision of the TMDE Support Center RPO.

D-3. Emergencies.

a. Leaks. Leaking of Sr-Y90 from its sealed capsule can occur as a result of age, corrosion, physical damage, faulty maintenance, or manufacturing defects. If leaks are detected or suspected:

(1) Discontinue use.

(2) Leave and secure the RADIAC Room immediately.

(3) Thoroughly wash hands and monitor clothing with the AN/PDR-27.

(4) Notify the installation RPO.

(5) Do not re-enter the work area until cleared by the installation RPO.

b. Fire. The primary concern is safety of personnel. When fire emergencies occur:

(1) Evacuate and lock the RADIAC Room.

(2) Notify the Fire Department and the installation RPO.

(3) Advise the firefighters of the location of radioactive sources.

(4) Do not re-enter the radiation area until monitored and cleared by the installation RPO.

D-4. References.

a. TB 11-6665-227-12.

b. TM 11-6665-227-12.

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Appendix E

Standing Operating Procedures for Storage, Handling, and Operation of the AN/UDM-6 Calibrator

E-1. Storage. The AN/UDM-6s will be stored in the established radiation controlled area (RADIAC Room). Access to the AN/UDM-6 calibrators will be controlled by the TMDE Support Center RPO.

E-2. Operation. All calibration operations using the AN/UDM-6 calibrator will be supervised by the TMDE Support Center RPO, who will ensure that:

a. The operators have received the training required according to references listed in paragraph E-4 here and have been approved as operator/user by the TMDE Support Center RPO.

b. Operating and maintenance instructions in the references are unit standard procedures for the AN/UDM-6s. The following precautions are repeated here for emphasis:

(1) Pu-239 is an extremely dangerous internal hazard. Even very small amounts inhaled, swallowed, or absorbed through open cuts in the skin can cause serious injury or death.

(2) Do not touch the radioactive sources or remove the jigs from the case.

(3) Do not eat, drink, or smoke while using or handling the AN/UDM-6s.

(4) Always wash hands thoroughly after handling and monitor hands with an alpha detecting radiacmeter. Repeat as required.

(5) Be careful not to drop the calibrator or deform it in any manner because this may cause the Pu-239 to flake off and contaminate surrounding objects.

c. Leak tests are conducted at frequency prescribed by references listed in paragraph E-4 here and forwarded to the U.S. Army Communications-Electronics Command (CECOM).

E-3. Emergencies.

a. Leaks. Pu-239 may leak as a result of flaking off due to age, physical damage, or manufacturing defects. If leaks are detected or suspected:

(1) Discontinue use.

(2) Seal calibrator in a leakproof plastic bag.

(3) Wash hands thoroughly; monitor hands and clothing.

E-1

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(4) Notify the installation RPO.

(5) Do not re-enter the RADIAC Room until decontaminated.

b. Fire. The primary concern is protection of personnel from injury and overexposure. When fire emergencies occur:

(1) Evacuate and lock RADIAC Room.

(2) Notify the Fire Department and the installation RPO.

(3) If time permits, remove the AN/UDM-6 calibrators to a safe location.

(4) Advise firefighters of radioactive source.

(5) Do not re-enter the radiation controlled area until cleared by the installation RPO.

E-4. References.

a. TM 11-6665-248-10.

b. Calibration instructions are contained in the Army TMDE Support Group (ATSG)-409 for AN/PDR-56F, or TM 11-6665-248-10 for AN/PDR-60.

Appendix F

Standing Operating Procedures for Shipment of RADIAC Calibrators

F-1. General. Except for required calibration and repair, RADIAC calibrators will not be shipped off the installation without prior approval and specific shipping instructions from the Army Materiel Command (AMC) licensee (commodity manager), see AR 385-11, table 3-1.

F-2. AN/UDM-2 Shipment.

a. Packaging. Latch the two components together securely and pack in the original manufacturer's corrugated cardboard shipping container or equivalent. Seal with pressure sensitive, waterproof tape.

b. Address Labels. Apply two DD Form 1387s.

c. Marking. Stencil outer container with the appropriate shipping name, e.g. “Radioactive Material, Special Form N.O.S.”.

d. Warning Labels. Apply SF 414 YELLOW II Labels and enter contents, e.g. “Sr-Y90 Solid”, then enter the number of curies, e.g. “100-20mc.”

F-3. AN/UDM-6 Shipment.

a. Packaging. Fasten the lid of the AN/UDM-6, wrap tightly in heavy paper, secure with tape, and place in an airtight plastic bag. Using suitable mailing filler, package in an outer container of wood or strong cardboard and seal with pressure sensitive, waterproof tape.

b. Address Labels. Apply two DD Form 1387s, Military Shipment Label.

c. Warning Labels. Not required. This is a limited quantity radioactive device exempt from Department of Transportation (DOT) specification packaging, marking, and labeling under Title 49 CFR
173.391 and TM 55-513, paragraph 6b.

d. Shipping Restrictions. Shipment of Pu-239 by U.S. Mail or air is prohibited, see AR 385-11, paragraph 4-3.

F-4. Documentation. Prepare the following documents and submit two copies to the installation Transportation Officer, Shipping Section:

a. The RPO Certification for Movement of Radioactive Materials.

b. The DD Form 1348-1, Department of Defense Single Line Item Release/Receipt Document.

F-5. Re-ship. On receiving the government bill of lading (GBL) number from the installation Transportation Officer, enter the GBL number on the address labels, the RPO Certification document, and the DD Form 1348-1, at item 14.

F-6. Distribute the completed shipping documents as follows:

a. RPO Certification - 1 copy w/shipment - 1 file copy.

b. GBL - 4 copies to carrier - 1 copy for RPO - 4 copies to installation Transportation Officer.

c. DD Form 1348-1 - 1 copy w/shipment - 1 file copy.

F-7. References.

a. Title 49 CFR 173-391.

b. AR 385-11.

c. TM 55 -315.

Appendix G

Movement of the M8A1 Automatic Chemical Agent Alarm and Other Military Equipment Containing Radioactive Material

G-1. General. Movement of the M8A1 is defined as the transportation of the M8A1 from the Devens Reserve Forces Training Area to a training area, or from a training area to the Devens Reserve Forces Training Area. This SOP does not pertain to the shipment of this instrument. The component of the M8A1 that contains the radioactive nuclide Americium (Am-241) is the M43Al Detector. The term "M43Al" will be used in place of the term "M8A1" for this SOP. This SOP deals in particular with the M43Al, but also applies to other military equipment containing radioactive material.

G-2. Procedures.

a. The personnel who accompany the equipment during the movement must be Active Army, Reserve Component (which includes National Guard), and DOD civilians. These personnel must be aware of the presence of radioactive material in the M43Al and knowledgeable of its associated hazards.

b. All units/activities moving the M43Al will submit a memorandum to the installation RPO, see sample at figure 1-1 on the back of this page.

c. An information copy of the memorandum with paragraphs 1, 2, and 3 completed will be provided to the installation RPO prior to movement. The original memo will be carried by the senior ranking individual accompanying the equipment during movement.

d. The M43Al will be visually inspected for damage prior to and immediately after each and every movement. The individual performing the inspection will verify that the equipment is in good condition by signing and dating the memo at paragraph 4. Equipment that is damaged or that contains a suspect source will have its status reported to the installation RPO.

e. On returning from moving the equipment, the unit will forward a copy of the completed memo, to include all signatures and dates of each visual inspection, to the installation RPO for retention.

G-3. Incident/Accident Procedures. Inventory information and actions to be taken in the event of an incident or accident can be found in the references listed below, see G-4. The installation RPO can be contacted for assistance in completing the inventory and in establishing emergency procedures.

G-4. References.

a. TB 43-0016.

b. TM 3-6665-312-12&P.

OFFICE SYMBOL (MARKS #) DATE

MEMORANDUM FOR INSTALLATION RPO, BOX # 52

SUBJECT: Military Movement of Radioactive Material

1. The following information pertains to the military movement of radioactive material.

   a. UNIT IDENTIFICATION:
   _____

   b. PURPOSE OF MOVEMENT:
   _____

   c. DEPARTURE DATE:
   _____

   d. DEPARTING FROM:
   _____

   e. DESTINATION: _____

   f. RETURN DATE: _____

2. The military or DOD personnel responsible for radiation safety during movement are:

   NAME TELEPHONE NUMBER
   _____ _____

   _____ _____

3. The following is an inventory of end items containing radioactive material(s):
   (ADD AS MANY LINES AS NEEDED HERE.)

   NOMENCLATURE QUANTITY RADIOACTIVENUCLIDE ACTIVITY/ITEM

   _____ _____ _____ _____

   _____ _____ _____
   _____

4. Visual inspection of equipment containing radioactive material was performed as indicated below:

NAME DATE

a. PRIOR TO DEPARTURE: _____ _____

b. AT DESTINATION: _____ _____

c. PRIOR TO RETURN: _____ _____

d. AFTER RETURN: _____ _____

SIGNATURE BLOCK

Figure 1-1 Sample memorandum

Appendix H

AN/UDM-2 Training Guidance for Operator/User

H-1. Purpose. To establish a standardized training program for AN/UDM-2 calibrator operators/users. The subject matter and duration of training is designed to meet the minimum operator/user training requirements of TB 11-6665-227-12, paragraph 9c, and more importantly, to ensure awareness of the potential hazards, and the necessity for following established safety precautions and procedures. The initial operator/user training will be conducted by the TMDE Support Center RPO.

H-2. Subject Matter.

a. Fundamentals of Nuclear Radiation (8 hours).

(1) Origin of nuclear radiation.

(2) Types.

(3) Units and terminology.

(4) Absorption.

(5) Ionization.

(6) External/internal hazards.

(7) RADIAC instruments.

(8) Photodosimetry.

(9) Survey techniques.

b. Handling, Care, and Operation of the AN/UDM-2 (16 hours)

(1) General purpose and use.

(2) Technical characteristics.

(3) Components and their use.

(4) Radioactive source locations.

(5) Inherent radiation hazards.

(6) Safety precautions.

(7) “Hands-on” training - consisting of:

(a) Unpacking calibrator and preparation for use.

(b) Proper use of TLD film badges

(c) Practice in all aspects of radiacmeter checking as outlined in TM 11-6665-227-12, chapter 3.

(d) Operator maintenance and the limitations.

Appendix I

TLD Film Badge Procedures

I-1. Occupational Exposure. This means working in or frequenting posted radiation controlled areas or working with equipment or devices which produce ionizing radiation. Specifically, this includes all personnel whose duties may result in whole body exposure exceeding any one of the following:

a. Two millirads in any one hour.

b. 100 millirads in any seven consecutive days.

c. 500 millirads in any calendar year.

d. Basic radiation protection standards given in AR 40-14 for other parts of the body.

I-2. Restrictions for Occupational Exposure. Individuals under 18 years of age and females known or suspected of being pregnant will not be occupationally exposed to ionizing radiation.

I-3. Females known or suspected of being pregnant will be counseled IAW NRC Regulatory Guide 8.13, Dec 87.

I-4. Care and Handling of TLD Film Badges. When not being worn, TLD film badges will be stored in a designated location outside of the radiation controlled area, and in the same location as the control film badge. To prevent theft, tampering, and deliberate misuse, the film badges will be kept in a locked room or container.

I-5. Wearing the TLD Film Badges.

a. Whole body badges will be worn at all times within a radiation controlled area and in any other situation where ionizing radiation is present or suspected. The whole body badge will be worn above the hips, below the shoulders, and on the outside of clothing.

b. Wrist badges will be worn, in addition to whole body badges, when operating the AN/UDM-2 calibrator, and at any other time when exposure of the forearms and hands is likely to exceed whole body dosage.

I-6. Issue and Turn-in.

a. The TLD film badges will be issued and turned-in on the last duty day preceding the wear date of the next month's film badges. The unit local RPO will be responsible for the prompt pick up and turn-in of all film badges for that unit or activity.

b. Individual TLD film badge assignments will be made by the unit local RPO and these names will be provided to the installation RPO. Individual assignments will not be changed without prior coordination with the installation RPO. Film badge issue records will be posted at the TLD film badge storage location and updated at the end of the wearing period.

c. A limited number of spare film badges and holders are available for the installation RPO, visitors, lost badges, planned contingencies, or other irregular needs.

d. In cases of actual or suspected exposure, a film badge may be turned-in for immediate return to the U.S. Army Ionizing Radiation Dosimetry Center for emergency processing and evaluation. In such cases, an unused film badge from the same period can be returned as a control.

I-7. Visitors to Storage Areas. Visitors will sign an area visitor's log and provide name, SSN, date of birth, and activity address. The visitor's log will identify the date, time, length of use, film badge number, and name of user. <u>In no instance will a visitor or anyone else be issued a film badge already assigned to another individual.</u>

1-8. References.

a. AR 40-14.

b. SB 11-206.

c. NRC Regulatory Guide 8.13.

Appendix J

Radioactive Material Control Point Standing Operating Procedures

J-1.General. The installation Supply Officer will operate and maintain the installation Radioactive Material Control Point (RMCP). This facility will provide a secure, radiation controlled, and monitored control point for receipt, storage, processing, and shipping of radioactive materials. The operation of this facility will be under the direct supervision of the DOL RPO, or other qualified individual designated by the installation Supply Officer.

J-2.Physical Area. Due to potential health hazards involved, this area will not be used for any other purpose.

J-3.Security. The bay containing the RMCP will be padlocked when not in use. A visual exterior physical security check will be made at the beginning of each duty day. Any evidence of unauthorized entry or attempted entry will be reported immediately to the Provost Marshal Office desk sergeant and the installation RPO.

J-4. Warning Signs. Standard radiation warnings will be permanently posted on the entrance gate and around the perimeter of the RMCP in such a way as to be conspicuous from any angle of approach.

J-5. Access. Complete access will be limited to the installation RPO and DOL RPO, their alternatives, and approved occupationally exposed personnel. Limited access may be granted to non-occupationally exposed personnel for pick up and delivery of radioactive shipments, maintenance of building and utilities, etc. Such access will be under the escort of the RPOs and alternates, and only after it has been determined that no radiation hazard exists in the areas to be visited.

J-6. Radiological Safety. Personnel within the RMCP will adhere to the following general safety procedures:

a. Wear your TLD film badge at all times.

b. Do not store or use food, beverages, tobacco, and cosmetics in the RMCP.

c. Personnel with open cuts or abrasions of the skin will not enter the processing area.

d. Wear surgical or electrical worker's rubber gloves when handling and/or processing unserviceable items. Use other protective clothing as prescribed by the RPO. Dispose of all protective clothing as unwanted radioactive materials. Protective clothing will be decontaminated as designated in AR 385-11 and reused for decon
operations.

J-1

e. Ensure buildings are thoroughly vented prior to commencing work.

f. Wash your hands thoroughly immediately after leaving.

g. Ensure the RMCP is included in monthly radiation surveys.

h. Strictly adhere to safety precautions and procedures for handling self-luminous devices as prescribed in TB MED 522.

J-7. Storage and Processing.

a. Place damaged and broken radioactive items and waste materials in plastic bags and store in covered steel drums.

b. Mark steel drums with radiation warning labels.

c. Maintain an inventory of all materials and include the following information for record:

(1) The number of items.

(2) The names (nomenclature) and National Stock Numbers (NSNs) .

(3) Radioisotopes and the activity/unit.

d. Store serviceable radioactive materials in their original shipping cartons or other suitable containers. Nuclear Radiation Commission (NRC) exempt quantities may be stored outside the RMCP.

e. Store tools, equipment, packing materials, steel storage containers, and any unused drums with readings of less than twice the background, at the entrance to the RMCP.

J-8.Emergencies. The primary concern in emergency situations is always the protection of personnel from injury and overexposure.

a. Contamination. Leaking of sealed sources and manufactured devices can result in serious contamination of work areas. When this occurs or is suspected:

(1) Evacuate and secure the area.

(2) Wash hands thoroughly; monitor hands and clothing with appropriate radiacmeter and ultraviolet light, if applicable.

(3) Notify the installation RPO.

(4) Do not re-enter the area until it is determined safe by a thorough survey and wipe tests.

b. Fire, Explosion, or Natural Disaster.

(1) Evacuate the area.

(2) Notify the Fire Department.

(3) Except for rescue or other overriding considerations, firefighters should not enter the radiation controlled area.

(4) All personnel should be evacuated from downwind areas.

(5) After the fire is extinguished, do not permit entry into the area until it is determined by a thorough survey to be safe from hazardous radiation and possible contamination.

J-9 References.

a. AR 385-11.

b. TB MED 522.

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Appendix K

Standing Operating Procedures for Shipment of Radioactive waste

K-1. General. Unserviceable radioactive waste materials will be accumulated and stored IAW TM 55-315 until sufficient quantities are on-hand to economically package and ship for disposal. Low-level radioactive waste from U.S. Army installations may be disposed of by land burial at selected areas throughout the United States. Disposal at these sites is by U.S. Army contract with the site operator and agreements with the state government concerned. As contract administrator, Headquarters, U.S. Army Industrial Operations Command (IOC) is the sole agent and authority for U.S. Army shipments for land burial at this location. Prior approval and specific shipping instructions must be obtained from IOC as outlined below.

K-2. Request for Disposal. Submit request for disposal directly to HQ, IOC (with information copy to FORSCOM, ATTN:, AFLG-RES), IAW AR 385-11. This must be done prior to packaging the material; this is necessary in the event that HQ, IOC determines that an audit by IOC Health Physicists prior to or during packaging is appropriate.

K-3 Shipping Instructions. On receipt of shipping instructions from HQ, IOC, review carefully to ensure compliance with special procedures concerning time limitations, state government restrictions, site contractor requirements, etc. The shipping instructions from HQ, IOC, will include all necessary certificates and forms required by the site contractor and the state government concerned with detailed instructions for their use. Also included with the shipping documents will be a checklist which must be completed and returned to HQ, IOC, along with any other required certifications prior to shipment. (There have been as many as four certifications required for a particular state and HQ, IOC.)

K-4. Packaging. Do not package prior to receiving specific instructions from HQ, IOC. Follow their checklist and instructions, together with the procedures outlined here; reconcile any procedural conflicts with HQ, IOC , DSN: 793-0338/17GG.

a. Containers (see TM 55-315, paragraph 7, and Title 10 CFR 13.393). The HQ, IOC, usually specifies type of container required, otherwise outer containers for shipment of radioactive waste will be 20 -gauge steel drums with gasket-sealed lids and bolted retaining rings. To keep the handling of materials to a minimum, use the storage container for shipping whenever practicable. Contents will be sealed in strong, airtight plastic liners with sufficient filler material to prevent shifting during transit. To accent marking and labeling, the outer surface of the drums should be painted YELLOW.

K-1

b. Quantity Limitations. The amount of radioactivity per package must be within the limits prescribed by DOT regulations. (See TM 55-315, page 11, table 3.)

c. Dose Rate Limits. (Reference DOT regulations.) Dose rate must not exceed 200 mr/hr at any point on the outer surface of the shipping container, or 10 mr/hr at three feet. The total Transport Index (TI) for the shipment, determined by totaling the TIs on all packages, shall not exceed 50.

d. Removable Surface Contamination (see Title 49 CFR 172.397, and TM 55-315, paragraph 8b [1]). A wipe test of each drum will be made after sealing, labeling, and marking of the container in final shipping configuration. Removable contamination must not exceed:

RADIOISOTOPE	TYPE RADIATION	MAXIMUM, CPM/100 Cm2
Uranium Natural	Alpha	2,200
Uranium Depleted	Beta-Gamma	22,000
Thorium Natural	Alpha	2,200
All other Radionuclides	Alpha	200
	Beta-Gamma	2,200

A wipe test analysis may be obtained through the installation RPO from the USACHPPM, Aberdeen Proving Grounds, MD. Record the wipe test results and retain with shipping documents.

e. Marking. The outer surface of the shipping drum will be labeled as follows:

(1) Appropriate shipping name of the radioactive material from DOT table 8, Title 49 CFR 172.101 (BLACK paint).

(2) Weight and volume of container (BLACK paint).

(3) Pkg _____ of _____ pkgs (number in BLACK paint).

(4) Name and address of consignee.

f. Radioactive Warning Labels (see TM 55-315 and DOT regulations). Each drum must have two of the applicable radioactive warning labels affixed to opposite sides.

(1) Determine applicable label by following specifics:

MAX DOSE RATE (mRem/hr)		LABEL REQUIRED
SURFACE	/ 3 FEET	
0.5	/ 0	White I (SF 413, rev 4-84)
50	/ 1.0	Yellow II (SF 413, rev 8-84)
200	/ 10.0	Yellow III (SF 413, rev 8-84)

(2) Additional information required on the warning labels must be legibly completed as follows:

(a) Contents - enter the name of every radionuclide present.

(b) Number of Curies - enter total activity in curies for each radionuclide present.

(c) Transport Index - enter the dose rate measured at three feet from the container.

g. Address Label. Apply one DD Form 1387, Military Shipment Label, to each container.

h. Documentation. Prepare a memorandum (see figure 2-1, page K-5) and forward to the installation Transportation Officer, MMD, DOL. The memo should be accompanied by the following:

(1) RPO certification for movement of radioactive materials.

(2) Completed contractor's radioactive shipment record.

(3) Completed compliance certificates when required by the state government and site contractor.

(4) Copy of disposition instructions from HQ, IOC.

* NOTE: Do not date these certificates until 48 hours prior to dispatch.

i. Shipment. The installation Transportation Officer will return the above documentation to the RPO, together with a GBL for shipment, to the disposal site. on receipt, the RPO will:

(1) Coordinate with installation Transportation Officer for pick up by the carrier.

(2) Within 48 hours of dispatch, sign, date, and enter GBL number on all forms and certificates.

(3) Dispatch shipment and distribute shipping documents as follows:

DOCUMENT	W/SHIPMENT		ITO	CARRIER	RPO	CONTRACTOR
GBL	0	4	4	1	1	
RPO Certs	1	1	0	1	1	
Contractor Forms	1	1	1	1	2	
State Certs	1	1	1	1	0	

j. Reship. The installation Transportation Officer will provide advance notification by letter, telegram, or telephone to the disposal site giving date of shipment, GBL # / control #, mode of transport, and date of arrival IAW HQ, IOC's instructions.

K-5. References.

a. AR 385-11, chapter 5.

b. Title 10 CFR 13.393.

c. Title 49 CFR 100.199.

d. Title 49 CFR 172.397.

e. TM 55-315.

OFFICE SYMBOL (385) DATE

MEMORANDUM FOR Installation Transportation Officer, DOL, Box #6

SUBJECT: Request for Shipment

1. This memorandum will include the following information as a minimum:

   a. Name of radionuclide.

   b. Number of curies.

   c. Date for pick up.

   d. Location for pick up.

   e. Destination.

   f. Number of containers.

   g. Weight of containers.

   h. Message number/point of contact of organization requesting shipment.

   i. Serial numbers of items.

   j. Type of radioactive warning labels.

2. This memorandum will be accompanied by those documents listed at item K-4h, entitled Documentation, (page K-3) in this memo.

Encls

SIGNATURE BLOCK

Figure 2-1 Example of memorandum, Request for Shipment

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Appendix L

Radiation Survey Procedures

L-1. Inspect each radioactive material storage/use area monthly for:

a. Adequacy of physical security.

b. General compliance with established safety precautions and procedures; spot check:

(1) TLD film badge storage / use / security.

(2) Food and smoking prohibitions.

(3) Availability of an AN/PDR-27 or other appropriate RADIAC instrument.

(4) Availability of radiation survey sketch approved by the installation RPO.

L-2. Survey and record radiation readings at each MR/HR point shown on the sketch (see Figure 3-1). Record other data shown on the sketch, sign and forward to the installation RPO.

L-3. Conduct swipe tests for removable contamination in work / use / storage areas as follows:

a. Immediately - when wipe tested or local monitor indicates a leaking source.

b. Annually - in areas where contamination is probable due to storage and processing of defective radioactive devices.

c. As required - but at least quarterly when removable contamination exceeds permissible limits outlined in Title 49 CFR 173.443.

L-4. For swipe test support, contact the installation RPO, extension 2440/2441.

L-5. Maintain records of radiation surveys IAW AR 25-400-2, Modern Army Recordkeeping System (MARKS).

L-1

Radiation Survey Sketch

_____ MR/HR W / WALL

UDM-6

WORK BENCH _____ MR/HR

UDM-2

STORAGE _____ MR/HR 1 Meter

UDM-2 _____ MR/HR 1 Mete
UDM-7
_____ MR/HR 2 Lead Boxes, 1 Lead Lined Safe _____ MR/HR
N.WALL ENTRANCE
_____ MR/HR E. WALL

RADIAC CALIBRATION ROOM
BLDG 3605

RPO / ACTIVITY: TMDE SPT OPN:

RADIOACTIVE MATERIAL(S) ON-HAND

AN/UDM-2 #
MC Sry 90

AN/UDM-2 #
MC Sry 90

AN/UDM-6 #
MC Pu 239

AN/UDM-7C #
MC

RADIATION DETECTION METHODS USED

AN/PDR-27, SN _____, Calibration Date: _____

Other
Remarks

TMDE RPO Signature

Installation RPO Signature

Figure 3-1 Sample Radiation Survey Sketch

Appendix M

Disaster Preparedness

M-1. The rescue and treatment of casualties is the first priority of the installation RPO. If the presence of alpha contamination has not been ruled out, personnel who enter the contaminated area will wear protective equipment. The following procedures will be observed:

a. Personnel will administer lifesaving first aid to stop bleeding (first aid to stop bleeding must not be undertaken by care providers unless the provider has taken and employed universal precautions e.g. gloving and shielding to protect against HIV/aids transfer), assure an open airway, and restore breathing and circulation. If casualty requires cardiopulmonary resuscitation (CPR), mouth-to-mouth is the least desirable method.

b. Personnel will move victims away from contaminated area by stretcher. They will apply lifesaving procedures immediately for critically injured casualties, regardless of the suspected levels of contamination.

c. Personnel will treat victims for shock.

d. Critically injured personnel will not go through the contamination control station if they are to be taken to a hospital immediately. However, an attempt must be made to reduce the spread of contamination. These attempts must in no way risk the lives of the injured. The following guidelines will be used:

(1) If there is no transportation to a hospital right away, and if it is not a risk to the victims, the contamination control station personnel will monitor and remove as much clothing as possible. (Up to 90% of the contamination may collect on outer clothing.)

(2) Personnel should wrap casualties in a blanket or a body bag. If monitoring indicates only a portion of the body is contaminated, enclose or cover that part. (For example, a surgical glove or a plastic bag may be used on a contaminated hand.)

(3) Team members will assist the less seriously injured through the contamination control station.

M-2. When victims are taken to a hospital, the following information must be obtained:

a. Name of victim. If victim is unconscious, get the information from dog tags or ID card.

b. Social security number.

M-1

c. Name of unit/activity, if known.

d. Name of hospital where victim was taken.

M-3. A member of the contamination control station team may have to accompany the victim to the hospital. He will ensure that the emergency medical technician (EMT) understands the nature of the contamination and the precautions to be taken. A decision must be made if the contamination control station team member should take a RADIAC instrument. If they are available, the team member will take one to monitor any suspected spread of contamination (i.e. the ambulance vehicle, the hospital stretchers, etc.). If none are available at the time, plans must be made to monitor the hospital later.

M-4. The EMTs and their essential equipment will also bypass the contamination control station for emergency treatment. The contamination control station team will attempt to transfer casualties to a "clean" ambulance at the HOT LINE, reuse the "dirty" ambulance and keep it in the contaminated area.

M-5. Common sense will be the general rule in the treatment of casualties.

a. The number one priority is the treatment of the injured.

b. The number two priority is to reduce the spread of contamination.

M-6. Accurate recording is essential.

M-2

Appendix N

Contamination Control Station

N-1. Purpose. The contamination control station (CCS) is a facility set up to prevent further spread of contamination. All personnel working in the CCS area must dress in full protective clothing. This includes work clothes, coveralls, shoe covers, hoods or hair caps, surgical gloves, and protective masks or respirators.

N-2. The CCS team will channel all personnel and equipment entering and leaving the accident scene through the CCS. They will keep accurate records to allow follow-on forces to re-monitor personnel after their departures.

N-3. The CCS team will not allow anyone to enter the clean area until they have monitored and decontaminated them. They also will not allow any items or equipment to pass into the clean area until they have been monitored, decontaminated, and packaged.

N-4. The CCS consists of three elements:

a. HOT LINE: This is a line that separates the area of known contamination from the contamination reduction area.

b. CONTAMINATION REDUCTION AREA: This area contains several stations and various supplies to eliminate or reduce contamination picked up by personnel in the contaminated area.

c. CONTAMINATED CONTROL LINE: This line separates the contamination reduction area from the clean or operations areas. It will be marked with WHITE engineer tape.

N-5. The CCS should be only as complex as the situation warrants. For response during peace time, this may include augmentation by quartermaster bath units or NBC decontamination teams. The following guidelines will be used to operate a CCS:

a. The RPO will mark the HOT LINE with WHITE engineer tape. Any response force personnel preparing to enter the accident area should dress out, adjust mask, and check equipment for proper operation before entering the CCS. The CCS personnel will inspect the response force for proper protective clothing and log-in all personnel and equipment.

b. The EMTs / medical care providers will be summoned and briefed concerning contamination issues.

c. Personnel returning from the accident site will use the following guidelines:

N-1

(1) Place all portable equipment and survey data on a large piece of heavy paper adjacent to the HOT LINE.

(2) Prepare to move single file through the contamination reduction area in an orderly manner.

(3) On reaching the HOT LINE, remove all tape from outer clothing and deposit it in a waste receptacle (plastic bag).

(4) Remove one shoe cover, foot will be monitored for alpha and beta-gamma contamination by CCS personnel. Step across the HOT LINE with that foot and place the shoe cover in a plastic bag. The probe of the instrument will be placed in contact with the surface being monitored (extreme care must be used not to allow the probe to be contaminated). Remove the other shoe cover, have foot monitored, step completely across the HOT LINE with that foot and place foot cover in a plastic bag. (NO ONE IS ALLOWED TO PROCEED FURTHER IF SHOES ARE CONTAMINATED.) Place new shoe covers on shoes and proceed. Take nose swipes is personnel are not masked. Proceed to decontamination station and decontaminate shoes. If decontamination is unsuccessful, remove shoes and place in a plastic bag. Monitor feet, if contaminated, decontaminate, then place fresh pair of shoe covers on feet and proceed.

(5) Remove the outer coverall, hood, and gloves and place in the appropriate containers. Care must be used to avoid contaminating the inner coverall with gloves or contaminating bare hands with the outer gloves.

(6) The CCS personnel will now conduct detailed monitoring of the entire body for both alpha and beta-gamma radiation contamination. Special attention will be paid to the neck, hands, hair, and feet.

(7) Remove the protective mask if on. Nose swipes will be taken, if not already done. Personnel found to be contaminated will be sent to a decontamination station. These personnel will be re-monitored before exiting the contamination reduction area.

(8) As the final step in this sequence, thoroughly wash face, neck, and hands; follow this as soon as possible with a complete body shower.

N-6. Nose Swipes.

a. If EMTs have not yet arrived to obtain nasal swipes, the RPO must. These swabs are the only means available to determine if internal contamination has occurred. They must be obtained within the first hour after contamination and before the casualty washes his face or showers completely.

N-2

b. A clean, moist cotton swab will be used. The RPO will swab each nostril separately. After the swipe is done, break the applicator and place it in a small envelope with identifying information. Label each envelope with the person's name, and the date and time of collection. All swabs will then be turned over to EMTs when they arrive.

N-7. They will check the CCS frequently for contamination during operations. Normally, this will be after every two to three persons process through it.

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Appendix O

Decontamination

O-1. General. The RPO will normally not undertake large-scale decontamination operations. Decontamination methods will vary according to the amount and type of contamination found.

O-2. Scope. Optimum effective decontamination will start with the simplest method. More complicated methods can then be attempted to reduce the remaining contamination.

O-3. Decontamination of personnel will normally receive priority.

O-4. Decontamination will normally be performed from the lowest to the highest level of contamination.

O-5. Contaminated waste (e.g. hair, clothing, towels, etc.) must be double bagged in plastic and disposed of IAW radioactive waste disposal (see appendix K for procedures).

O-6. The CCS HOT LINE team monitors personnel at the CCS to detect contamination on the body, determine who needs decontamination, and identifies potential skin contamination. Monitoring for alpha contamination is slow and difficult. Results of alpha monitoring in the rain may be misleading because moisture reduces the accuracy of monitoring.

O-7. The selection and correct use of proper instruments is essential. The alpha HOT LINE team will use the AN/PDR-60, the AN/PDR-56, or other appropriate instrumentation to monitor personnel. Monitors should use earphones to listen to the noise for counts per minute (CPMs). This would allow them to concentrate on moving the probe, rather than watching the dial. The use of earphones will greatly speed up the monitoring process.

O-8. Team members should pay particular attention to those areas of the body that are most likely to be contaminated, such as the hands and feet.

O-9. Medical personnel identified by the RPO will supervise the monitoring of the wounded. They should also monitor themselves frequently to prevent contamination of medical supplies, equipment, and other personnel. All persons must be decontaminated prior to leaving the CCS. Casualties are the ONLY EXCEPTION to this rule.

O-10. If the CCS HOT LINE team finds personnel in excess of two times the background level, the personnel will be decontaminated.

O-1

O-11. Personnel coming from the contaminated area will initially be monitored on entering the CCS. They will then remove outer clothing consisting of boot covers, gloves, respirator, coveralls, and surgical caps. Any hot spots will be cleaned with swabs or masking tape to reduce the spread of contamination.

O-12. After washing with soapy water and rinsing, individuals must be thoroughly dry before being re-monitored at the contaminated control line, since water will shield alpha particles.

O-13. If decontamination is not fully effective, the following techniques will be used:

a. Body and Skin. Spot-clean hot spots using swabs and masking tape. Re-monitor to determine effectiveness.

(1) Wash entire body, hair, and hands using soap and plenty of hot water. Clean fingernails. Do not use abrasive or highly alkaline soaps or powders. Be sure not to puncture or abrade skin through excessive scrubbing in any of these procedures.

(2) If soap is not effective, use the following materials:

(a) A water paste mixture consisting of 50% powdered detergent and 50% corn meal. Massage with mixture for five minutes and then rinse thoroughly with water.

(b) Waterless cleanser (hand soap).

b. Hair.

(1) Wash hair several times. Repeat until decontamination has been effected or further washing will obviously be ineffective.

(2) If contamination is not lowered to acceptable levels, shave the head and apply skin decontamination procedures.

c. Wounds. Wounds will be treated by such first aid measures as appropriate without consideration of contamination. If alpha contamination is found on other parts of the body when monitored, assume that wounds are alpha contaminated. After applying first aid, refer the casualty to medical personnel to determine the appropriate priority of action.

O-2

Appendix P

Hazards

P-1. Hazardous Materials. Radioactive materials likely to be present at an accident site are Plutonium (Pu), Tritium (H3), Uranium 235 and 238, and other products.

a. Plutonium (Pu) is a radioactive element which looks like stainless steel when it is first processed, but within seconds oxidizes to a brownish-black color. When involved in a fire, plutonium may burn, producing radioactive plutonium particles. Detonation of the highly explosive component of a nuclear weapon may pulverize the plutonium into small particles that range in size from microscopic to jagged chunks of metal. The explosion disperses these small particles in smoke and dust, causing contamination over a large area. The hazard to the general public or anyone near the accident site will depend on the weather conditions, the direction and speed of the wind, the size of the particles, and the amount of fire and smoke. The location of those exposed in relation to these factors is also important. Plutonium in a pulverized form is flammable. The wind, verticals, low-flying aircraft, and personnel operating in the area may re-suspend the pulverized plutonium. Air sampling is necessary to properly evaluate this hazard. The plutonium being referred to is Plutonium-239. It emits a 5.15 me V alpha particle that travels about four centimeters in the air (1.575 inches).

(1) The primary hazard of plutonium is inhaling its alpha emitting particles. The amount absorbed through the lungs is the critical factor. This is difficult to estimate because absorption depends on particle size, solubility and density, and the breathing rate of the individual. Most plutonium that enters the bloodstream deposits itself in the bones and the liver. Heavy metal poisoning is highly probable. A few months after exposure, 80 to 90% of deposited plutonium will still be found in the lungs.

(2) If there is any possibility that plutonium is airborne at the accident site, AMST personnel will wear an M17 Mask until any cloud or smoke has settled or drifted away from the area. How long this will take depends on weather conditions and the intensity and duration of fires at the accident site. Personnel should wear their protective mask until the possibility of blowing dust or smoke has passed, or until air sampling equipment indicates less than twice times background radiation level for airborne alpha contamination.

(3) The entry of plutonium into the bloodstream through deep skin cuts is also a hazard. Thorough cleansing and bandaging will normally prevent this.

b. Tritium (H3). Is a radioactive isotype of hydrogen. Like plutonium and uranium, it causes contamination and its long-term

P-1

health effects are similar - cancer, mutations in genetic material, and chronic kidney disease. It has a half-life of 12.6 years. Tritium readily combines with many elements such as hydrogen and oxygen. Tritium released into the atmosphere oxidizes rapidly to produce radioactive water. It is a weak beta emitter and cannot be detected by common field instruments. Radioactive water is readily absorbed by the body, is chemically similar to normal water, and is rapidly distributed throughout body tissue. Protective clothing may offer temporary protection from the skin absorption of tritium, but air filtering respirators have no protective value. Therefore, a self-contained breathing apparatus is required for respiratory protection in a tritium environment.

c. Uranium (U). May be at the accident site as Uranium 235 or 238. When first processed, it looks like stainless steel, but oxidizes to a golden color, then to a blue-black or black color. Like plutonium, uranium is a heavy metal, an alpha emitter, flammable in powdered form, and sparks brightly when scratched with a metal object. Uranium particles enter the body in the same manner as plutonium and-present similar radiological health hazards. Uranium particles also cause heavy metal poisoning. Safety precautions for plutonium also apply to uranium.

d. Fission Products.

(1) Should a nuclear weapon or device involved in an accident result in a partial yield, the fission products will produce a beta-gamma radiation hazard. This is in addition to alpha hazards from unfissioned uranium or plutonium.

(2) Alpha particles produce low-level radiation, but cannot penetrate the skin. Beta particles generate a skin- penetrating, mid-level radiation. High-energy gamma radiation is capable of penetrating steel from two to four centimeters thick. Because of the short range and low penetrating ability of beta particles, they constitute a limited external hazard, but may produce skin burns if they remain in contact with the skin for any length of time. Radiation from the nuclear fission product is a serious internal hazard. Protective clothing and equipment should be worn to prevent the ingestion, inhalation, and spread of any fission products.

e. Alpha Radiation.

(1) The AMST personnel will consider any reading two times (2x) the background as a hazardous contaminated area.

(2) Any disposition amount greater than three microcuries/m2 or 8,000 CPMs on the AN/PDR-60 and FIDDLER probe per square meter for alpha radiation may produce a serious re-suspension problem The plutonium may become airborne. When alpha contamination is detected, the AMST personnel should assume Pu 239 because it constitutes the greater internal hazard.

f. Beta/Gamma Radiation. The AMST personnel should consider any reading of beta or gamma radiation above 10 millirads/per/hour as a hazardous contaminated area. The AMST personnel should use the AN/PDR-27, -56, or -77 RADIAC meter to measure beta/gamma radiation. Large-scale beta/gamma radiation will result only from a nuclear detonation or partial nuclear yield. Since nuclear weapons are designed to minimize the probability of accidental detonation, this occurrence will be extremely rare. On the other hand, low-level gamma radiation is emitted during plutonium decay. Therefore, localized hot-spot readings of several millirads/per/hour may be present even though a nuclear yield has not occurred.

TABLE 1-1
CONVERSION TABLE - AN/PDR-56 WITH 11cm2 PROBE - uCi/m2

SOIL	CONCRETE	PLYWOOD	STAINLESS STEEL
CONVERSION	.03792	.0316	.02528 .0158
CPM			
50	1.896	1.580	1.264 .790
100	3.792	3.160	2.528 1.580
200	7.584	6.320	5.056 3.160
300	11.376	9.480	7.584 4.740
400	15.168	12.640	10.112 6.320
600	22.752	18.960	15.168 9.480
800	30.336	25.280	20.224 12.640
1000	37.920	31.600	25.280 15.800
1200	45.504	37.920	30.336 18.960
1400	53.088	44.240	35.392 22.120
1500	56.880	47.400	37.920 23.700
1750	66.360	55.300	44.240 27.650
2000	75.840	63.200	50.560 31.600
2200	83.424	69.520	55.616 34.760
2400	91.008	75.840	60.672 37.920
2500	94.800	79.000	63.200 39.500
2700	102.384	85.320	68.256 42.660
3000	113.760	94.800	75.840 47.400
4000	151.680	126.400	101.120 63.200
5000	189.600	158.000	126.400 79.000
6000	227.520	189.600	151.680 94.800
7000	265.440	221.200	176.960 110.600
8000	303.360	252.800	202.240 126.400
9000	341.280	284.400	227.520 142.200
10000	379.200	316.000	252.800 158.000
11000	417.120	347.600	278.080 173.800
12000	455.040	379.200	303.360 189.600
15000	568.800	474.000	379.200 237.000
25000	948.000	790.000	632.000 395.000
30000	1137.600	948.000	758.400 474.000

40000	1516.800	1264.000	1011.200	632.000
50000	1896.000	1580.000	1264.000	790.000
75000	2844.000	2370.000	1896.000	1185.000
100000	3792.000	3160.000	2528.000	1580.000

Table 1-1 Conversion Table

TABLE 1-2
CONVERSION TABLE - AN/PDR-56 WITH 11cm2 PROBE - uCi/m2

	SOIL	CONCRETE	PLYWOOD	STAINLESS STEEL
CONVERSION	.029077	.0024231	.0019385	.0012115
CPM				
50	.145	.121	.097	.061
100	.291	.242	.194	.121
200	.582	.485	.388	.242
300	.872	.727	.582	.363
400	1.163	.969	.775	.485
600	1.745	1.454	1.163	.772
800	2.326	1.938	1.551	.969
1000	2.908	2.423	1.938	1.211
1200	3.489	2.908	2.326	1.454
1400	4.071	3.392	2.714	1.696
1500	4.362	3.635	2.908	1.817
1750	5.088	4.240	3.392	2.120
2000	5.815	4.846	3.877	2.423
2200	6.397	5.331	4.265	2.665
2400	6.978	5.815	4.652	2.908
2500	7.269	6.058	4.846	3.029
2700	7.851	6.542	5.234	3.271
3000	8.723	7.269	5.816	3.634
4000	11.631	9.692	7.754	4.846
5000	14.539	12.116	9.692	6.057
6000	17.446	14.539	11.631	7.269
7000	20.354	16.962	13.569	8.480
8000	23.262	19.385	15.508	9.692
9000	26.169	21.808	17.447	10.903
10000	29.077	24.231	19.385	12.115
11000	31.985	26.654	21.323	13.326
12000	34.892	29.077	23.262	14.538
15000	43.615	36.346	29.077	18.172
25000	72.692	60.578	48.462	30.287
30000	87.231	72.693	58.155	36.345
40000	116.308	96.924	77.540	48.460

50000	145.385	121.155	96.925	60.575
75000	218.078	181.733	145.387	90.862
100000	290.770	242.310	193.850	121.150

Table 1-2 Conversion Table

TABLE 1-3
CONVERSION TABLE - AN/PDR60 - uCi/m2

	SOIL	CONCRETE	PLYWOOD	STAINLESS STEEL
CONVERSION	.0004615	.0003846	.0003077	.0001923
CPM				
50	.023	.019	.015	.010
100	.046	.038	.031	.019
200	.092	.077	.062	.038
300	.138	.115	.092	.058
400	.185	.154	.123	.077
600	.277	.231	.185	.115
800	.369	.308	.246	.154
1000	.462	.385	.308	.192
1200	.554	.462	.369	.231
1400	.646	.538	.431	.269
1500	.692	.577	.462	.288
1750	.808	.673	.538	.337
2000	.923	.769	.615	.385
2200	1.015	.846	.677	.423
2400	1.108	.923	.738	.462
2500	1.154	.962	.769	.481
2700	1.246	1.038	.831	.519
3000	1.385	1.154	.923	.577
4000	1.846	1.538	1.231	.769
5000	2.308	1.923	1.538	.962
6000	2.769	2.309	1.846	1.154
7000	3.231	2.692	2.154	1.346
8000	3.692	3.077	2.462	1.538
9000	4.154	3.461	2.769	1.731
10000	4.615	3.846	3.077	1.923
11000	5.077	4.231	3.385	2.115
12000	5.538	4.615	3.692	2.308
15000	6.923	5.769	4.615	2.885
25000	11.537	9.615	7.692	4.808
30000	13.845	11.538	9.231	5.769
40000	18.460	15.384	12.308	7.692

50000	23.075	19.230	15.385	9.615
75000	34.612	28.845	20.078	14.423
100000	46.150	38.460	30.770	19.230

Table 1-3 Conversion Table

TABLE 1-4
CONVERSION TABLE - AN/PDR-60 - uCi/m2

	SOIL	CONCRETE	PLYWOOD	STAINLESS STEEL
CONVERSION	.0060	.0050	.0040	.0025
CPM				
50	.300	.250	.200	.125
100	.600	.500	.400	.250
200	1.200	1.000	.800	.500
300	1.800	1.500	1.200	.750
400	2.400	2.000	1.600	1.000
600	3.600	3.000	2.400	1.500
800	4.800	4.000	3.200	2.000
1000	6.000	5.000	4.000	2.500
1200	7.200	6.000	4.800	3.000
1400	8.400	7.000	5.600	3.500
1500	9.000	7.500	6.000	3.750
1750	10.500	8.750	7.000	4.375
2000	12.000	10.000	8.000	5.000
2200	13.200	11.000	8.800	5.500
2400	14.400	12.000	9.600	6.000
2500	15.000	12.500	10.000	6.250
2700	16.200	13.500	10.800	6.750
3000	18.000	15.000	12.000	7.500
4000	24.000	20.000	16.000	10.000
5000	30.000	25.000	20.000	12.500
6000	36.000	30.000	24.000	15.000
7000	42.000	35.000	28.000	17.500
8000	48.000	40.000	32.000	20.000
9000	54.000	45.000	36.000	22.500
10000	60.000	50.000	40.000	25.000
11000	66.000	55.000	44.000	27.500
12000	72.000	60.000	48.000	30.000
15000	90.000	75.000	60.000	37.500
25000	150.000	125.000	100.000	62.500
30000	180.000	150.000	120.000	75.000
40000	240.000	200.000	160.000	100.000

50000	300.000	250.000	200.000	125.000
75000	450.000	375.000	300.000	187.500
100000	600.000	500.000	400.000	250.000

Table 1-4 Conversion Table

TABLE 1-5
CONVERSION TABLE - AN/PDR-56 WITH 17cm2 PROBE - uCi/m2

	SOIL	CONCRETE	PLYWOOD	STAINLESS STEEL
CONVERSION	.00180	.00150	.00120	.00075
CPM				
50	.090	.075	.060	.037
100	.180	.150	.120	.075
200	.360	.300	.240	.150
300	.540	.450	.360	.225
400	.720	.600	.480	.300
600	1.080	.900	.720	.450
800	1.440	1.200	.960	.600
1000	1.800	1.500	1.200	.750
1200	2.160	1.800	1.440	.900
1400	2.520	2.100	1.680	1.050
1500	2.700	2.250	1.800	1.125
1750	3.150	2.625	2.100	1.312
2000	3.600	3.000	2.400	1.500
2200	3.960	3.300	2.640	1.650
2400	4.320	3.600	2.880	1.800
2500	4.500	3.750	3.000	1.875
2700	4.860	4.050	3.240	2.025
3000	5.400	4.500	3.600	2.250
4000	7.200	6.000	4.800	3.000
5000	9.000	7.500	6.000	3.750
6000	10.800	9.000	7.200	4.500
7000	12.600	10.500	8.400	5.250
8000	14.400	12.000	9.600	6.000
9000	16.200	13.500	10.800	6.750
10000	18.000	15.000	12.000	7.500
11000	19.800	16.500	13.200	8.250
12000	21.600	18.000	14.400	9.000
15000	27.000	22.500	18.000	11.250
25000	45.000	37.500	30.000	18.750
30000	54.000	45.000	36.000	22.500
40000	72.000	60.000	48.000	30.000

50000 90.000 75.000 60.000 37.500
75000 135.000 112.500 90.000 56.250
100000 180.000 150.000 120.000 75.000

Table 1-5 Conversion Table

TABLE 1-6
CONVERSION TABLE - AN/PDR-56 WITH 17cm2 PROBE - ug/m2

	SOIL	CONCRETE	PLYWOOD	STAINLESS STEEL
CONVERSION	.02400	.02000	.01600	.01000
CPM				
50	1.200	1.000	.800	.500
100	2.400	2.000	1.600	1.000
200	4.800	4.000	3.200	2.000
300	7.200	6.000	4.800	3.000
400	9.600	8.000	6.400	4.000
600	14.400	12.000	9.600	6.000
800	19.200	16.000	12.800	8.000
1000	24.000	20.000	16.000	10.000
1200	28.800	24.000	19.200	12.000
1400	33.600	28.000	22.400	14.000
1500	36.000	30.000	24.000	15.000
1750	42.000	35.000	28.000	17.500
2000	48.000	40.000	32.000	20.000
2200	52.800	44.000	35.200	22.000
2400	57.600	48.000	38.400	24.000
2500	60.000	50.000	40.000	25.000
2700	64.800	54.000	43.200	27.000
3000	72.000	60.000	48.000	30.000
4000	96.000	80.000	64.000	40.000
5000	120.000	100.000	80.000	50.000
6000	144.000	120.000	96.000	60.000
7000	168.000	140.000	112.000	70.000
8000	192.000	160.000	128.000	80.000
9000	216.000	180.000	144.000	90.000
10000	240.000	200.000	160.000	100.000
11000	264.000	220.000	176.000	110.000
12000	288.000	240.000	192.000	120.000
15000	360.000	300.000	240.000	150.000
25000	600.000	500.000	400.000	250.000
30000	720.000	600.000	480.000	300.000

40000	960.000	800.000	640.000	400.000
50000	200.000	1000.000	800.000	500.000
75000	800.000	1500.000	1200.000	750.000
100000	400.000	2000.000	1600.000	1000.000

Table 1-6 Conversion Table

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Appendix Q

Reports

Q-1. Accurate reporting is essential.

Q-2. The radiological control log will be used at the contamination control station to monitor entry or exit of personnel into the accident area.

Q-3. The Monitoring Team Report will be filled out at the plotting station. It will also be used for recording information on the Staplex air samplers.

Q-4. The DA Form 1594, Incident Log, will be used to record significant events.

Q-5. A recorder will be responsible for all reports. Depending on the scope of the accident, after action or status reports may be required by Forces Command (FORSCOM), US Army Reserve Command (USARC), Ft. McCoy, the commodity license holder, the NRC, the Surgeon Generals Office, etc. (See appendix S, item la for references.

Q-1

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Appendix R

Glossary

R-1. Airborne radioactivity. Any radioactive material suspended in the atmosphere.

R-2. Air sampler. A device used to collect a sample of the radioactive particles suspended in the air.

R-3. Alpha radiation. Is the least penetrating of the common types of radiation, but is characterized by a high ionizing capability. They represent practically no hazard outside the body, but alpha emitting materials are extremely dangerous if absorbed into the body.

R-4. Alpha teams. Army teams possessing an alpha radiation monitoring capability. They are usually identified as part of a nuclear accident and incident response and assistance (NAIRA) team.

R-5. Anticontamination clothing. Clothing consisting of coveralls, shoe covers, cotton gloves, and hoods or hair caps. Anticontamination clothing provides protection for the user from alpha or beta radiation, but is primarily a control device to prevent the spread of contamination. A respiratory mask is worn with the anticontamination clothing to provide protection against the inhalation of contaminants.

R-6. Background count. In conjunction with health protection, the background count usually includes radiation produced by naturally occurring radioactivity and cosmic rays in an uncontaminated area near or adjacent to the contaminated site used for comparison or base line purposes.

R-7. Background radiation. Radiation arising from radioactive material other than that directly under consideration. Background radiation due to cosmic rays and natural radioactivity is always present.

R-8. Beryllium (Be). A light steel-gray, strong, brittle, toxic, bivalent, metallic element used chiefly as a hardening agent in alloys. Beryllium is found in nuclear weapon components.

R-9. Beta radiation. Compared on the basis of the same energy, beta particles are more penetrating than alpha particles, but are less penetrating than gamma rays or x-rays. Therefore, beta particles are more hazardous from outside the body than alpha particles. Beta emitting materials are also extremely dangerous if absorbed into the body.

R-10. Bioassay. The methods for determining the amount of internal contamination received by an individual.

R-1

R-11. Contamination. The deposit or absorption of radioactive materials, biological or chemical agents, on and by structures, areas, personnel, or objects.

R-12. Contamination contour lines. The limits of radioactive contamination extending outward from an accident site.

R-13. Contamination control. Procedures to avoid, reduce, remove, or render harmless, temporarily or permanently, nuclear, biological, and chemical contamination for the purpose of maintaining or enhancing the efficient conduct of military operations.

R-14. Contamination control line. The inner boundary of a contamination control station.

R-15. Contamination control station. An area specifically designated for permitting the coming in and going out of personnel and equipment to and from a radiation control area. The outer boundary of a contamination control station is the radiological control line; the inner boundary is the line segment labeled the contamination control line.

R-16. Cumulative dose. The total dose resulting from repeated exposure to radiation of the same area of the body or the whole body.

R-17. Custody. Responsibility for the control, transfer, movement of and access to, weapons and components. Custody also includes the maintenance of accountability for weapons and components.

R-18. Decay. The decrease in the radiation intensity of any radioactive material with respect to time.

R-19. Decontamination station. A building or location suitably equipped and organized where personnel and materials are cleansed of chemical, biological, or radiological contaminants.

R-20. Disintegration. A means of measuring the process of spontaneous breakdown of a nucleus of an atom resulting in the emission of a photon.

R-21. Exclusion area. Any designated area containing one or more nuclear weapons or components. During the initial phase of a nuclear weapon accident or incident, it consists of a 610-meter (2,000-foot) radius around the accident or incident site.

R-22. Explosive ordnance disposal. The detection, identification, field evaluation, rendering-safe procedures, and disposal of explosive ordnance that have become hazardous by damage or deterioration when the disposal of such ordnance is beyond the capabilities of personnel normally assigned the responsibility for routine disposal.

R-2

R-23. FIDDLER (Field instrument for the detection of low energy radiation). A probe used with the PRM-5 and other supporting instrument packages capable of detecting low-energy gamma radiation and x-rays.

R-24. Film badge. A gamma or x-ray sensitive film packet to be carried by personnel, usually in the form of a badge, and used for measuring and permanently recording gamma ray dosage.

R-25. Gamma radiation. High energy electromagnetic radiation similar to x-rays. Compared on the basis of the same energy, gamma rays are more penetrating than alpha or beta particles.

R-26. Hot line. A line separating the area of known contamination from a contamination reduction area.

R-27. Initial response force. Personnel from the nearest military installation (custodial or non-custodial), regardless of size, who respond to a nuclear accident or incident to take immediate emergency measures, and to provide federal presence and humanitarian support.

R-28. Initial response force commander. The commander of either a custodial or non-custodial response force who responds to an Army nuclear accident or incident to provide a military presence and initial command and control of the accident or incident scene prior to the arrival of the on-scene commander and the service response force.

R-29. Lead (Pb). A soft, malleable, ductile, bluish-white metallic element that is used in radiation shielding.

R-30. Lithium (Li). A soft, silvery, highly-reactive metallic element that is used as a heat transferring element in thermonuclear weapons.

R-31. Monitoring. The act of detecting the presence or absence of radiation and measurement with radiation-measuring instruments.

R-32. Nuclear accident and incident response and assistance (NAIRA) team. The assistance provided after a significant accident or incident involving nuclear weapons or radiological nuclear weapon components to:

a. Evaluate the radiological hazard.

b. Accomplish emergency rescue and first aid.

c. Minimize safety hazards to the public.

d. Minimize exposure of personnel to radiation and radioactive materials.

R-3

e. Establish security to protect classified government materials.

f. Minimize the spread of radioactive contamination.

g. Minimize damaging effects on property.

h. Disseminate technical information and medical advice to the appropriate authorities.

i. Inform the public to minimize alarm and promote orderly accomplishment of emergency functions.

j. Support recovery operations of damaged weapons or weapon components.

k. Support the removal of radiological hazards.

R-33. Nuclear radiation. Particulate and electromagnetic radiation emitted from atomic nuclei in various nuclear processes. The important nuclear radiations are alpha and beta particles, gamma rays, and neutrons. All nuclear radiations are ionizing radiations, but the reverse is not true.

R-34. Nuclear weapon accident. An unexpected event involving nuclear weapons or radiological nuclear weapon components that result in any of the following:

a. Accidental or unauthorized launching, firing, or use by U.S. forces or U.S. supported allied forces, of a nuclear-capable weapon system that could create the risk of war.

b. Nuclear detonation.

c. Non-nuclear detonation or burning of nuclear weapons or radiological weapon components.

d. Radioactive contamination.

e. Seizure, theft, loss, or destruction of nuclear weapons or radiological nuclear weapon components, to include jettison.

f. Public hazard, actual or implied.

R-35. Nuclear weapon minor incident. An unexpected event involving a nuclear weapon, facility, or component resulting in any of the following, but not constituting a nuclear weapon accident or significant incident:

a. An increase in the possibility of explosion or radioactive contamination.

b. Error committed in the assembly, testing, loading, or transporting of equipment, the malfunction of equipment and materials leading to unintentional operation of part or all of the weapon's arming and firing sequence, or leading to a substantial change of yield or increased dud probability.

c. An act of God, unfavorable environment or condition resulting in damage to a weapon, facility, or component.

d. An unscheduled landing of a mission aircraft during a logistical air movement.

e. An accident involving a nuclear-capable missile system.

R-36. Nuclear weapon significant incident. An unexpected event involving nuclear weapons or radiological nuclear weapon components that do not fall in the nuclear weapon accident category but:

a. Results in evident damage to a nuclear weapon or radiological nuclear weapon component to the extent that major rework, complete replacement, or examination or re-certification by the Department of Energy is required.

b. Requires immediate action in the interest of public safety or nuclear weapons security.

c. May result in adverse public reaction, whether national or international, or premature release of classified information.

d. Could lead to a nuclear weapon accident and warrants high officials or agencies be informed or take action.

R-37. On-scene commander. The service response force commander designated to command and control all action at a nuclear accident or incident. A general officer or equivalent trained in the unique aspects of NAIRA team operations.

R-38. Physical security. That part of security concerned with physical measures designed to safeguard personnel and to prevent unauthorized access to equipment, facilities, materials, and documents.

R-39. Plutonium (Pu). A radioactive, metallic element, chemically similar to uranium, formed as the isotope 239 by decay of neptunium and found in minute quantities in pitchblende, that undergoes slow disintegration with the emission of a helium nucleus to form uranium 235, and is fissionable with flow neutrons to yield atomic energy. The Pu-239 isotope is used primarily in nuclear weapons.

R-40. Rad. A unit of absorbed dose radiation. One rad represents the absorption of 100 ergs of nuclear (or ionizing) radiation per gram of the absorbing material or tissue.

R-41. RADIAC. A term devised to designate various types of radiological measuring instruments. It is derived from the words “radioactivity detection indication and computation” and is normally used as an adjective.

R-42. Radiation Protection Officer (RPO). A person appointed by the commander to give advice on the hazard of ionizing radiation and to supply effective ways to control these hazards.

R-43. Radioactivity. The property possessed by some elements (as uranium) of spontaneously emitting alpha or beta rays, and sometimes also gamma rays, by the disintegration of the nuclei of atoms, and also the rays emitted.

R-44. Radiological control area. The control area encompassing all known or suspected radiological contamination at a nuclear weapon accident.

R-45. Radiological control team. Special radiological teams of the U.S. Army and Navy that are organized to provide technical assistance and advice in radiological emergencies.

R-46. Radiological survey. The directed effort to determine the distribution of radiological material and dose rates in a radiological emergency.

R-47. Radionuclide. A radioactive atomic particle distinguished by the composition of its nucleus (e.g. by the number of protons and neutrons).

R-48. Roentgen. A unit of exposure to gamma or x-ray radiation in dosimetry. One roentgen is essentially equal to one rad.

R-49. Rough point survey. A hasty radiological surveying technique in which the area surrounding a nuclear accident site is monitored at four to eight points to determine the presence or absence of any radiological contamination.

R-50. Service response force. A response force appropriately manned, equipped, and capable of performing and coordinating all actions necessary to effectively control and recover from an accident or incident. The specific purpose of the service response force is to provide nuclear weapon accident or nuclear weapon significant incident assistance. Service response forces are organized and maintained by those services that have custody of nuclear weapons of radioactive nuclear weapon components.

R-51. System International (SI) units. An internationally accepted system of measuring ionizing radiation quantity/dose.

R-52. Transport Index (TI). The dimensionless number, rounded up to the first decimal place, that is placed on the label of a package to designate the degree of control the carrier must exercise during transport.

R-53. Tritium (H3). Tritium is a radioactive isotope of hydrogen having one proton and two neutrons in the nucleus. Tritium is a beta emitter.

R-54. Uranium (U). Uranium is a heavy, silvery-white, naturally occurring radioactive metallic element. In air, the metal becomes coated with a layer of oxide. Its appearance ranges from a golden yellow color to almost black. Uranium is an alpha emitter.

R-55. Uranium (U-235). A light isotope of uranium of mass number 235 that is physically separable from natural uranium, that when bombarded with slow neutrons undergoes rapid fission into smaller atoms with the release of neutrons and atomic energy, and that is used in power plants and atom bombs.

R-56. Warhead. That part of a missile, projectile, torpedo, rocket or other munition that contains either the nuclear or thermonuclear system, high-explosive system, chemical or biological agents, or inert materials intended to inflict damage.

R-57. Whole body count. The process of identifying and measuring the radiation emitted from the body and due to radioactive contamination.

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Appendix S

References

S-1. Required references.

a. Army Regulations (ARs).

(1) AR 40-13, Medical Support - Nuclear / Chemical Accidents and Incidents.

(2) AR 40-14, Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials.

(3) AR 385-11, Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety).

(4) AR 385-30, Safety Color Code Markings and Signs.

(5) AR 385-40, Accident Reports and Records.

b. Technical Bulletins (TBs).

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

(2) TB 43-0116, Identification of Radioactive Items in the Army Supply System.

(3) TB 43-0122, Instructions for the Safe Handling and Identification of U.S. Army Communications-Electronics Command Managed Radioactive Items in the Army Supply System.

(4) TB 43-0141, Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by the U.S. Army Troop Support and Aviation Material Readiness Command (Excluding Aircraft Components).

(5) TB 43-0197, Instructions for Safe Handling, Maintenance, Storage, and Disposal of Radioactive Items Managed by U.S. Army Armament Material Readiness Command.

c. Technical Manuals (TMs).

(1) TM 3-261, Handling and Disposal of Unwanted Radioactive Material.

(2) TM 3-6665-312-12&P, Operator’s and Organizational Maintenance Manual, Including Repair Parts and Special Tools List for M8A1 Automatic Chemical Agent Alarm and Auxiliary Equipment M10 Power

Supply; M10A1 Power Supply; M228 High Profile Mounting Kit; and M18Z Low Profile Mounting Kit.

(3) TM 11-6665-227-12, Operator's and Organizational Maintenance Manual: Calibrator Set, RADIAC, AN/UDM-2.

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

(5) TM 11-6665-361-10, Operator's Manual for Radioactive Test Sample, Krypton 85, Gamma, MX-7338/PDR-27.

(6) TM 55-315, Transportability Guidance for Safe Transport of Radioactive Materials.

(7) TM MED 522, Occupational and Environmental Health: Control of Health Hazards from Protective Material Used in Self-Luminous Devices.

d. Code of Federal Regulations (CFRs).

(1) Title 10 CFRs- 13.393; 20; 20.206; 30.71, Schedule B.

(2) Title 49 CFRs- 172.101, DOT Table 8; 172.391; 172.397; 173.411; 173.443.

NOTE: Obtain CFRs from:

Association of American Railways
Bureau of Explosives
50 F Street
N.W. Washington, D.C. 20001

Telephone: (202) 639-2222

or

American Labelmark Company
Labelmaster Division
5724 N. Pulaskis Road
Chicago, IL 60646

e. Miscellaneous.

(1) ATSG 409, Calibration Procedures for RADIAC Set AN/PDR-56F - may be obtained from U.S. Army TMDE Support Group (ATSG), ATTN: AMXTM-LPP, Redstone Arsenal, AL 35898-5400.

(2) SB 11-206, Personnel Dosimetry Supply and Service for Technical Radiation Exposure Control.

S-2. Related references.

a. AR 25-400-2, Modern Army Recordkeeping System (MARKS).

b. AR 40-5, Preventive Medicine.

c. AR 700-64, Radioactive Commodities in the DOD Supply System.

d. Title 49 CFR 100-199.

e. TC 3-15, Nuclear Accident and Incident Response and Assistance (NAIRA).

S-3. Points of contact/reference.

a. DOL, Shipping/Receiving 796 - 2281

b. DOL, Maintenance / Electronics / Weapons 796 - 2337
- 3902
- 3404

c. 94th U.S. Army Reserve Command 796 - 6330/
- 6331

d. BRAC Environmental Coordinator 796 - 3114 x311

e. Natick Prev Med / Occupational Health (508) 651 -5417

f. Fire Department 772 - 4500

g. Massachusetts Emergency Mgmt Agency 772 - 3122

h. Massachusetts Dept. of Public Health (617) 727 - 6214

i. FORSCOM Safety DSN: 367 - 5764/
- 5754/
- 5596

j. USARC Safety COM:
(404) 629 - 8654

k. USACHPPM COM:
(410) 671 - 4643
DSN: 584 - 8234
- 3502

l. U.S. Army Chemical School DSN: 865 - 5737
Fort McClellan, AL COM:
(204) 848 - 5926

m. Thermoluminescent Device (TLD)
Analysis DSN: 746 - 3529

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Appendix T

Protective Measures

T-1. Purpose. Since alpha contamination is an internal hazard, adequate precautions must be taken to prevent entry into the body. Alpha concentration can be inhaled, ingested, or absorbed through cuts and breaks in the skin. Maximum protection must be provided to prevent contamination of the individual and the air he/she breathes. Effective protective measures are an important aspect of contamination control and will greatly reduce the hazard to personnel and subsequent decontamination efforts for equipment and personnel.

T-2. Scope. It is quite difficult to protect some equipment against contamination because of size and usage. However, through proper selection, protection, and control, this problem can be reduced.

a. If possible, equipment should never be placed directly on the ground because of possible contamination. Some expendable material, such as heavy paper, should be placed beneath all items, including equipment in plastic bags. Only the minimum amount of equipment should be used. If possible, the same equipment should be used in related operations in the contaminated area rather than bringing in additional equipment for each operation.

b. All selected equipment must be kept as clean as possible to reduce spread of contamination and decontamination problems.

c. All equipment used in the contaminated area should be decontaminated at the end of the operation-

d. Certain equipment, such as RADIAC meters, can be enclosed in plastic bags and the cables covered with masking tape. However, the alpha probes must be left uncovered.

T-3. Personnel entering the contaminated area must be fully dressed in protective clothing.

a. This clothing will not reduce exposure to beta/gamma radiation, but will reduce the body contamination, help prevent the spread of contamination, and ease subsequent decontamination work.

b. Protective clothing consists of:

(1) Coveralls.

(2) Shoe covers.

(3) Cotton gloves.

(4) Hoods or hair caps.

(5) M17A2 Protective Masks.

c. All openings in the clothing must be taped closed so that there will be no entry of contamination into the body.

(1) This protective clothing will be systematically removed during passage through the contamination control station to minimize the spread of contamination.

(2) The protective clothing is then packaged as contaminated clothing.

d. In instances where protective clothing is not available, battle dress uniforms (BDUs) may be worn. As in the case of protective clothing, all openings must be taped closed. The use of BDUs presents an added problem in that clothing must be made available for personnel exiting the area, as they will not be permitted to leave in contaminated BDUs.

T-4. Food and tobacco will not be permitted in the contaminated areas.

T-5. Expendable supplies, e.g. paper caps, booties, coveralls, etc., may be obtained from the Nuclear Power Outfitters, Crystal Lake, Illinois, telephone: 1-800-252-8777.

T-2

Appendix U

Uniform Requirements

U-1. Purpose. To prescribe the basic uniform and personal equipment required of all AMST members.

U-2. Uniform:

a. Battle dress uniform, 2 each.

b. Poncho.

c. Canteen with carrier and cup.

d. Protective mask.

e. * Coat, BDU.

f. * Cap, insulated helmet.

g. LBE with field first aid kit.

h. Overshoes, rubber.

i. Sleeping bag.

j. Mess kit.

* Dependent on climatic conditions.

U-3 Items not worn will be placed in the Alice Pack and carried by the individual.

U-1

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Appendix V

Department of Defense

Radiation Testing and Tracking System (DODRATTS)

V-1. The following provides the instructions for receipt, issue, turn-in, transfer, adjustment, reconciliation, and wipe test of the DODRATTS at unit level.

V-2. References.

a. AR 710-2, Supply Policy Below the Wholesale Level, 28 Feb 92.

b. AR 710-3, Asset and Transaction Reporting System, 15 May 92.

V-3. Purpose.

a. To advise and provide guidance to all property book officers (PBOs) in the use of the DODRATTS and to establish user radiation safety through adherence to the philosophy of "ALARA" - keeping exposure to the harmful effects of ionizing radiation at a level that is "as low as reasonably achievable."

b. The U.S. Army is authorized to process and use the chemical agent monitors (CAMs) and the chemical agent detectors (CADs) under the Nuclear Regulatory Commission (NRC) License 12-00722-13 & 12-00722-14.

c. The DODRATTS is used to maintain continuous visibility by serial numbers and wipe testing of all chemical detector cells and drift tube modules from procurement through demilitarization and disposal. Strict control of all cells and drift tubes is for the safety of the user and maintainer. (The radioactive source National Stock Numbers (NSNs) are: 6665-01-114-0073 for all chemical detector cells; 6665-99-257-0069 for drift tube modules.)

d. The chemical detector cell is a component of the M43Al Chemical Agent Detector. The cell (C) and detector (D) serial numbers must be reported together, e.g. Z03-C-xxxxx and Z03-D-xxxxx. The M43Al is a component of the M8Al Chemical Agent Alarm system.

e. The drift tube module is the key component of the chemical agent monitor. The CAM system has two serial numbers to be reported, e.g. Z16-C-xxxxx and Z16-M-xxxxx.

V-4. General. The DODRATTS is designed to provide the identification of the last active Army or Reserve unit accountable for a specific serial-numbered cell and to track wipe test data.

V-1

Property book officers will ensure that both DODRATTS serial numbers are recorded in property books. Changes will be reported to the source serialization officer (SSO) as prescribed in AR 710-3. Serial numbers will be reconciled as directed by the SSO.

V-5. Procedures.

a. Turn-ins will require the following steps:

(1) Commanders will ensure that all CADs and CAMs have had the required wipe test accomplished no earlier than six months prior to the turn-in date. All CADs and CAMs must not have any parts missing.

(2) Prepare a Department of the Army (DA) Form 2765, Request for Issue or Turn-in, with serial number listed in block 0, entitled Item Description. If turn-in quantity is more than one, put serial numbers on back of DA Form 2765. See the enclosed example showing how to enter the information.

(3) The DA Form 2765 will be brought to the SSO to verify the serial numbers against the DODRATTS register. If serial numbers are correct, the SSO will initial the form for turn-in. If serial numbers do not match, turn-in will be rejected and the PBO contacted to correct the problem.

(4) The unit will turn-in items to the DOL radiation storage facility.

b. All other transactions such as receipts, issues, transfers, and adjustments will be reported to the SSO using the appropriate forms.

c. Wipe tests will require the following steps:

(1) The SSO will notify the units which serial numbers are due for wipe tests.

(2) Units will coordinate with the U.S. Army Test, Measurement, and Diagnostic Equipment (TMDE) Support Center, for wipe testing on M43A1s (CADs).

(3) The CAMs are wipe tested at the DOL, Material Maintenance Division (MMD).

(4) Both the TMDE Support Center and the DOL MMD will send wipe test results to the SSO for input into the DODRATTS. If wipe test readings exceed acceptable contamination levels, the device will be held for disposition instructions. (The maximum is 20 disintegrations per minute.)

(5) If at any time a source is removed from a device by the unit or the TMDE Support Center, the SSO must be notified. The SSO will prepare "X" and "Y" transactions and notify the DOD Central Registry.

V-6. Reconciliation Procedures.

a. An annual 100% reconciliation is required for the sources (cells and detectors) with the DOD Central Registry and the PBOs.

b. Data reported by the SSO will be used to compare unit records to the master file records at the DOD Central Registry.

c. The SSO will schedule reconciliation times with the units. A serialization report by the Department of Defense Activity Address Code (DODAAC) will be sent to each PBO for physical verification of serial numbers.

d. Any discrepancy must be reported and explained. The reconciliation report will be returned to the SSO according to the instructions provided with the serialization report.

INSERT page V-4 here. See paper copy of Devens RFTA Memo 385-11

FOR THE COMMANDER

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H. CARTER HUNT, JR.
Installation Commander

MELISSA A. DENTINO
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DISTRIBUTION:
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