DEPARTMENT OF THE ARMY
US ARMY TMDE ACTIVITY REGION EUROPE
CMR 434, APO AE 09138

USATA, Region Europe SOP 700-48 **12 DECEMBER 2011**

RADIOACTIVE MATERIAL PROCESSING FACILITY AND HEALTH PHYSICS LABORATORY STANDARD OPERATING PROCEDURE

Applicability: US Army Test Measurement Diagnostic Equipment (TMDE) Activity, Region Europe, Radioactive Materials Processing Facility (RMPF) and Health Physics Laboratory personnel and authorized users.

1. PURPOSE: This Standard Operating Procedure (SOP) establishes and defines responsibilities, policies, and operating procedures for the Radioactive Material Processing Facility (RMPF) and Health Physics Laboratory (HPL). RMPF and HPL are maintained and supported by the U.S. Army Test, Measurement, and Diagnostic Equipment Activity (USATA), Region Europe, Nucleonic Area Calibration Laboratory (ACL).

2. REFERENCES:

a. DA Pam 385-24 The Army Safety Program.
b. AMCOM Regulation 11-2, Radiation Safety: U.S. Army Test, Measurement, and Diagnostic Equipment Activity Worldwide Radiation Safety Program.
c. AE Regulation 55-4 Safe Movement of Hazardous Good by Surface Modes
d. AR 710-3 Inventory Management Asset and Transaction Reporting System
e. TB 43-0116 Identification of Radioactive Items in the Army

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Annex C – Submission of Swipes Samples to be Analyzed for Isotopes ***other than*** Tritium (H3).
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This SOP supersedes USATR-E RMPF SOP 700-48 dated 25 October 2005

4. **POLICY:**

a. The RMPF is a radioactive material (RAM) consolidation facility which controls, receives, and monitors incoming shipments of unwanted radioactive materials from Army, Air Force, and/or any DoD organizations in the European and South West Asia theaters of operation. Received materials are temporarily stored and then processed for conveyance to CONUS for recycling and/or transfer to a Defense Consolidation Facility (DCF). Processing includes identification, concentration, decontamination, packing, marking, and labeling. An integral part of this work is in the process monitoring, periodic radiological surveys, and the evaluation of hazards incident to the processing of these materials to prevent the spread of contamination to insure the safety and health protection of assigned personnel and visitors. Some medical materials are selected for elimination in country in accordance with applicable Host Nation regulations and/or agreements.

b. The HPL performs and/or provides nuclear counting evaluations, health physics services, identification of unknown radioactive isotopes, and radiological analysis (i.e. survey swipes) from locations where radioactive materials are used, processed, and/or stored. Advises operating officials of unsafe radiological conditions and necessary remedial actions. The HPL is authorized to evaluate the periodic license required leak tests performed on radioactive commodities identified as Individually Controlled Radioactive Item (ICRI) and/or commodities controlled under the Radioactive Test and Tracking System (RATTS).

5. **RESPONSIBILITIES:**

a. Commanders of units performing leak testing on the Chemical Detection Equipment (CAD, CAM, ICAM, M-22), Troxler, or other commodities (to include maintaining Tritium (H-3) devices) are responsible for ensuring that all RAM is handled, stored, transported, and/or shipped in accordance with Host Nation, Nuclear Regulatory Commission, Department of Defense, US Army, and local requirements. Will insure RAM is handled in a safe and secure manner and will not be allowed to pose a hazard to personnel or the environment. RAM volume will be kept to a minimum. Radioactive material will not be mixed with non-radioactive material. Radioactive isotopes will not be mixed without written permission of the Radiation Safety Officer (RSO) for the unit and/or the RMPF.

b. Commanders of units possessing unserviceable radioactive commodities and/or RAM will contact the RMPF facility prior to turn in to ensure that their radioactive commodities/RAM meet the criteria for turn in to the RMPF. Radioactive Commodities not covered by a Nuclear Regulatory Commission (NRC) license, RAM that did not originate from a NRC licensed source, and foreign source items will not be accepted by the RMPF for turn in except under special circumstances.

c. Commanders of units requesting analysis on radiological swipes and/or leak tests are required to insure all samples are submitted in accordance with the policy and procedures delineated in this SOP.

6. **PROCEDURES:**

a. For Submission of RAM generated by Sustainment Maintenance Units performing a Radioactive Commodity Leak Testing Program (i.e. for CAD, CAM, Troxler), and/or laboratory RAM trash (i.e. gloves, paper, swipes), see ANNEX A.

b. For Submission of Unserviceable Commodities that Contain Radioactive Material, see ANNEX B.

c. For Submission of Radiological Swipes (i.e. area surveys, leak tests) to be analyzed for Isotopes **other than** Tritium (H-3), see ANNEX C.

d. For Submission of Radiological Swipes Suspected to Contain and/or to be analyzed for Tritium (H-3), see ANNEX D.

e. RMPF / HPL Customer Service Operating Hours: 0800 – 1500 Monday through Friday (Closed American Holidays / Limited Operations on German Holidays)

f. RMPF / HPL Contact Points:
Phone: DSN-E: 495-6486 / 6123
Fax: 495-7293
Civilian: 06331 86 + last 4 of DSN
Email: tmdenucleonics@cmtymail.26asg.army.mil

g. RMPF / HPL Location: Husterhoeh Kaserne (USAMMCE Annex)
Building 4145
Pirmasens, Germany

h. DoDAAC: W90GX0

i. RMPF / HPL Mailing Address:

(1) MPS: U.S. Army TMDE Region-Europe
ATTN: AMSAM-TMD-E-PN
Nucleonic ACL / RMPF
CMR 434, APO AE 09138

(2) Civilian: U.S. Army TMDE Region-Europe Husterhoeh Kaserne,
Geb: 4145
66953 Pirmasens, Germany

7. Point of contact for all information and/or guidance comprised in this SOP is Joseph Higgs, USATA, Region Europe, RSO, DSN-E 495-6486 / 6123, Fax 495-7293, email: joseph.higgs1@us.army.mil

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RSO, USATA, Region Europe

Approved by: Andrew Lee Roberts
Director, USATA, Region Europe

ANNEX A

Accumulation and Submission of RAM generated by Units performing a Radioactive Commodity Leak Testing Program and/or as a result of Laboratory Operations

1. A separate container will be designated for each radionuclide used in the unit. Each container will be marked "Caution, Radioactive Material", bear the radiation symbol in black or magenta on a yellow background, and be marked with the nuclide for which it is intended (i.e. Am-241, Ni-63). Container inner and outer surface should be painted. The individual responsible for performing the leak test is responsible for proper segregation and disposition of potentially contaminated items.

2. Each container will have an inventory sheet that will be changed out and a copy sent along with the RAM from the containers at the necessary intervals.

3. Each container will be lined with a strong plastic bag containing no rips, tears or punctures.

4. Potentially contaminated items will be placed in the appropriate container and entered on the container inventory sheet.

5. No liquids will be placed in the container.

6. When transfer of RAM is deemed necessary, the plastic bag will be sealed, removed from the container, marked "Radioactive", and placed in another strong plastic bag containing no rips, tears, or punctures. The second bag will be sealed and labeled "UN2910 "

7. **Complete a DD Form 1348-1(A) as indicated at ANNEX E.**

8. Contact should be made to the RMPF prior to transportation.
NOTE: Transportation of RAM by a privately owned vehicle (POV) is not authorized.

9. No RAM will be sent thru Military Postal Service (MPS). **If RAM is to be shipped via Government transportation or commercial delivery service,** strictly adhere to the following procedures:

a. All shipments will be authorized in written disposition instructions from either the USAREUR Safety Office and/or the RMPF.

b. The shipper shall package all of the RAM as specified in paragraph. 6. in a new, single strong-tight container, such as a cardboard, wooden, or fiberboard box or metal drum with sufficient packaging material *(No Styrofoam Peanuts)* to prevent damage to contents under conditions normally incident to transportation. All seams will be securely taped with nylon reinforced tape.

c. After the material is packed, a RSO will monitor all sides including top and bottom of the container with a gamma survey meter (i.e. AN/PDR-77 or equivalent) to insure that the exposure rate at the surface of the container does not exceed 0.5 mRem/h (5 µSv/h). The RMPF will be contacted for further instructions if the measured exposure rate exceeds this value.

d. The container will be shipped with a proper shipping name of UN2910, Radioactive Material-Excepted Package, Limited Quantity of Material, 7, (E) in accordance with 49 CFR 173.421 and European ADR 2.2.7.9. As such the package is exempt from the other specification packaging, shipping papers, certification, marking and labeling requirements specified in 49 CFR and the ADR.

e. As per 49 CFR 173.422 and the European ADR 5.2.1.7.2, the outside of the package **MUST** show the UN identification of " **UN2910** ".

f. As per 49 CFR 173.422 the shipper's and reciever's addess **WILL BE AFFIXED** to the outside of each package.

g. As per the ADR 2.2.7.9.7, the transport document (i.e. DD Form 2890 Multimodal Dangerous Goods Declatraion) **MUST** show the proper shipping name " **UN2910, Radioactive Material Excepted Package-Limited Quantity of Material, (7), (E)** " in block 14. **Fill out DD Form 2890 in coordination with the Transportaion Officer, the Dangerous Goods Advisor, and Haz12 certified individual in accordance with AE Regulation 55-4.**

g. In accordance with 49 CFR 173.443(a) and AE Regulatoin 55-4, a RSO will insure that the removable contamination levels on the outside of the final shipping container is **not more than 0.4 Bq/cm^2 (beta/gamma) and less than 0.04 Bq/cm^2 (alpha) by conducting a transportation radiation shipment survey**. If the readings exceed these limits, a new, non-contaminated container should be used and an investigation initiated to determine the source of removable contamination.

10. Utilize the applicable mailing address noted for the RMPF in SOP 700-48, paragraph 6.i.

ANNEX B

Submission of Unserviceable Commodities that Contain Radioactive Material

1. Excess or condemned items that cannot be reutilized, recycled, transferred, donated, and/or sold shall be disposed of in accordance with Defense Demilitarization Manual, DoD 4160.21-M. These items shall be demilitarized in accordance with applicable Army regulations and/or technical orders by removing the radioactive components whenever possible. The demilitarized end item shall be disposed of through the local Defense Reutilization and Marketing Office (DRMO). The radioactive material(s) and/or component(s) shall be transferred to the RMPF as per the instructions contained in this annex.

2. The generator must verify the radionuclide and activity of each item to be transferred to the RMPF using TB 43-0116 or other verifiable means to insure compliance with all applicable regulations. Radioactive material will be separated according to isotope. Separated groups should be placed in clear zip lock plastic bag(s), the bag(s) closed, and labeled with the radionuclide to include total activity for that bag.

3. When transfer of RAM is deemed necessary the plastic bag(s) will be sealed and placed in another strong plastic bag containing no rips, tears, or punctures. The second bag will be sealed and labeled or marked Radioactive Material "UN2911".

4. **Disposition of items covered under the Unique Item Tracking (UIT) and/or Radiation Testing and Tracking System (RATTS) (i.e. CAM, CAD)** shall be coordinated through the 21st Support Operation (Item Manager), prior to submission to the RMPF. (See AR 710-3)

5. **Complete a DD Form 1348-1(A) as indicated at ANNEX E so items may be transferred from the unit property book upon reciept by the RMPF if applicable.**

6. Contact will be made to the RMPF prior to transportation.
NOTE: Transportation of RAM by a privately owned vehicle (POV) is not authorized.

7. No RAM will be sent thru Military Postal Service (MPS). **If RAM is to be shipped via Government transportation or commercial delivery service,** strictly adhere to the following procedures:

a. All shipments will be authorized in written disposition instructions from the USAREUR Safety Office and/or the RMPF.

b. The shipper shall package the material in a new, single strong-tight container, such as a cardboard, wooden, or fiberboard box or metal drum with sufficient packaging material *(No*

c. *Styrofoam Peanuts)* to prevent damage to contents under conditions normally incident to transportation. All seams will be securely taped with nylon reinforced tape.

c. After the material is packed, a RSO will monitor all sides including top and bottom of the container with a gamma survey meter (i.e. AN/PDR-77 or equivalent) to insure that the exposure rate at the surface of the container does not exceed 0.5 mRem/h (5 uSv/h). USAREUR RMPF, TMDE Region-Europe will be contacted for further instructions if the measured exposure rate exceeds this value.

d. The container can be shipped as Radioactive Material, Excepted Package – Instruments or Articles, UN2911, 7 (e) in accordance with 49 CFR 173.424 and ADR 2.2.7.9; and as such is exempt from the other specification packaging, shipping papers, certification, marking and labeling requirements specified in 49 CFR and the ADR.

e. As per 49 CFR 173.422 and the European ADR 5.2.1.7.2, the outside of the package **MUST** show the UN identification of " **UN2911** ".

f. As per 49 CFR 173.422 the shipper's and reciever's addess **WILL BE AFFIXED** to the outside of each package.

g . As per the ADR 2.2.7.9.7, the transport document (i.e. DD Form 2890, Multi Modal Dangerous Goods Declaration) **MUST** show the proper shipping name of " **UN2911 Radioactive Material, Excepted Package-Insturments or Articles, 7, (E)** " in Block 14. **Fill out DD Form 2890 in coordination with the Transportaion Officer, the Dangerous Goods Advisor, and Haz12 certified individual in accordance with AE Regulation 55-4.**

h. In accordance with 49 CFR 173.443(a) a RSO will insure that the removable contamination levels on the outside of a previously used final shipping container is **not more than 0.4 Bq/cm^2 (beta/gamma) and less than 0.04 Bq/cm^2 (alpha) by conducting a transportation radiation survey prior to transport**. If the readings exceed these limits, a new, non-contaminated container should be used and an investigation initiated to determine the source of removable contamination. A new transport container may be used in lieu of a transporation survey when transporting chemical defense equipment or tritium devices that have passed an illumination test.

8. Utilize the applicable mailing address noted for the RMPF in SOP 700-48, paragraph 6.i.

ANNEX C

Submission of Swipes Samples to be Analyzed for Isotopes ***other than*** Tritium (H-3)

1. All swipes **MUST** be accompanied by a request for evaluation memorandum containing at least the following information:

a. Name and Address of requesting organization and/or unit.

b. Type of evaluation by isotope to be performed (i.e. Am-241, Ni-63, DU, etc.). "Gross Alpha/Beta" is the term applicable to evaluations for any or all isotopes.

c. Point of contact (POC) to include name, phone, fax, and if possible, email address. POC will have direct knowledge of circumstances applicable to the swipe(s) submitted.

d. Each swipe **MUST** have some form of control indicator (i.e. #1, #2, A, B, Room #1-A)

2. Swipe(s) will be placed and sealed in a small envelope or plastic zip lock bag with "RADIOACTIVE" marked on the outside.

3. The small envelope or plastic zip lock bag will then be sealed and placed in a larger envelope or box with memorandum detailed in paragraph 1. above. **ENVELOPE(S) WILL BE SEALED WITH TAPE. DO NOT LICK TO SEAL.**

4. Submit swipe(s) directly to the HPL or through MPS / Post utilizing the appropriate address detailed in paragraph 6.i. of the SOP. "**MAILROOM – DO NOT OPEN**" will be annotated on the outside of any envelope and/or box submitted through a postal system.

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ANNEX D

Submission of Swipes Samples to be Analyzed for Tritium (H-3)

1. All swipes **MUST** be accompanied by a request for evaluation memorandum containing at least the following information:

a. Name and Address of requesting organization and/or unit.

b. Annotation that H-3 is the type of evaluation to be performed.

c. Point of contact (POC) to include name, phone, fax, and if possible, email address. POC will have direct knowledge of circumstances applicable to the swipe(s) submitted.

d. Each swipe **MUST** have some form of control indicator (i.e. #1, #2, A, B, Room #1-A)

2. Swipe(s) will be wetted with approximately 1 milliliter (ml) of distilled water *(approximately 3-4 small drops from an eye dropper)* prior to performance of swipe/leak test.

3. Immediately after performance of swipe/leak test the swipe will be placed and sealed in a small plastic zip lock bag or 18 ml scintillation vial (NSN 6640-01-141-3871). The preferred method for submitting a H-3 swipe would be in a vial.

4. The vial(s) or plastic zip lock bag(s) will be placed in a small envelope or plastic bag with "RADIOACTIVE" marked on the outside.

5. The envelope or plastic zip lock bag will then be placed in a larger envelope or box with memorandum detailed in paragraph 1 above. **ENVELOPE(S) WILL BE SEALED WITH TAPE. DO NOT LICK TO SEAL.**

6. Submit swipe(s) directly to the Nucleonics ACL or through MPS / Post utilizing the appropriate address detailed in paragraph 6.i. of the SOP. "**MAILROOM – DO NOT OPEN**" will be annotated on the outside of any envelope and/or box submitted through a postal system.

DD FORM 1348-1A, JUL 91 ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7	23 24	25 26 27 28 29	45 46 47 48 49 50	51	52 53	54 55 56	57 58 59	60 61	62 63 64	65 66	67 68 69	70	71 72	73 74 75 76 77 78 79 80
DOCUMENT	RI FROM	M&S	UNIT	QUANTITY	SER	SUPPLEMENTARY ADDRESS	SIG	FUND	DISTRIBUTION	PROJECT	PRI	REQD	DDEATE	ADV	RI	O/P	COND	MGT
				013														

1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
	Unit Address	RMPF

UNIT PRICE		DOLLARS	CTS
DOLLARS	CTS		

4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

Item NSN (i.e. 123-45-678-9012)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

Quantity or Weight
Isotope (i.e. H-3)

27. ADDITIONAL DATA

Unit:
Address
DoDAAC
POC

SAMPLE FORM

PREVIOUS EDITION MAY BE USED

USAPA V1.00

DD FORM 1348-1A, JUL 91 ISSUE RELEASE/RECEIPT DOCUMENT

| | | |

ANNEX F

Glossary (Abbreviations and Definitions)

1. Abbreviations:

ADR
automated dosimetry report

ADR (For Germany)
European Agreement concerning the international carriage of dangerous goods by road (ADR) and protocol of signature

AIRDC
Army Ionizing Radiation Dosimetry Center

ALARA
as low as is reasonably achievable

Bkd
Background

Bq
Becquerel

CAD
chemical agent detector (M43A1)

CAM
chemical agent monitor

CFR
Code of Federal Regulations

dpm
disintegrations per minute

dps
disintegrations per second

eV
electron volt

Gy
Gray

kBq
kilobecquerel

mCi
millicurie

mrad
millirad

mSv
millisievert

new
never before used from a souce such as the transportion office's packing supplies

RADIAC
radiation detection, indication, and computation

RAM
radioactive material

RATTS

Radioactive Test and Tracking System

RCO
radiation control officer

RSO
radiation safety officer

SI
Systemé Internationale (International System)

Sv
Sievert

UIT

Unique Item Tracking

2. Definitions:

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

ALARA
Acronym for "as low as reasonably achievable". Interpretation being to make every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical and consistent with the purpose for which the licensed activity has undertaken. Taken into account is the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations in relation to utilization of nuclear energy and/or licensed radioactive materials.

Alpha Particle
A positively charged particle of matter emitted by the nucleous of a radioactive atom. Radioactive atoms with large atomic weight and very little penetrating ability.

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

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

Beta Particle
A negatively charged particle of matter emitted from the nucleus of a radioactive atom, having mass and charge equal to an electron. They travel further than alpha particles and have an intermediate penetrating ability.

Curie (Ci)
A unit of radioactivity equal to 37 billion becquerels.

Dose equivalent
The product of absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest in tissue. The units of dose equivalent are the rem and sievert (Sv).

Gamma Ray

A type of radiant energy emitted from the nucleus of radioactive atoms that can cause ionization of matter. This type of radiation can travel a great distance and has a very high penetrating ability.

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

High radiation area
An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Ionization
Separation of a normally electrically neutral atom or molecule into electrically charged components.

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

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

Low-level radioactive waste (LLRW)
See Radioactive waste, low-level.

Micro-(u□)
An SI unit prefix indicating a factor of one one-millionth (10-6)

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

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

Radiation area
An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

Radiation Control Officer
The person that the commander designates, in writing, as the executive agent for the command's radioactive commodities under Unique Item Tracking (UIT) and/or Radiation Testing and Tracking System (RATTS).

Radiation Protection Program (RPP)
A program to implement the objective of radiation safety and protection.
a. The Army's radiation protection program includes all aspects of:
(1) Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.
(2) Army compliance with Federal and DOD radiation safety regulations.
(3) The Army's radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and radiation instrument TMDE and calibration programs.
b. A command's radiation protection program includes all aspects of:
(1) Measurement and evaluation of radiation and radioactive material within the command as they pertain to protection of personnel and the environment.
(2) Compliance with Federal, DOD, and Army radiation safety regulations.

Radiation Safety Officer
The person that the commander designates in writing as the executive agent for the command's radiation safety program. Same as *Radiation Protection Officer (RPO)*

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

Radioactive waste, low-level (LLRW)
Material the NRC classifies as low-level radioactive waste, waste not classified as high-level radioactive waste (spent nuclear fuel), as transuranic waste, or as uranium or thorium tailings and waste; material acceptable for burial in a land disposal facility.

Rem
A unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).

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

Source material
Any form of radioactive material. Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

Thermoluminescent Dosimetry: (*TLD*) A device with a thermoluminescent material insert worn by personnel exposed to ionizing radiation to measure the dosage received. This device is used to measure the individual dosage therefore it is often referred to as personal dosimetry.