

## MANUAL

DOE M 470.4-6

Approved: 8-26-05

Review: 8-26-07

Chg 1: 8-14-06

# NUCLEAR MATERIAL CONTROL AND ACCOUNTABILITY

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**U.S. DEPARTMENT OF ENERGY**  
Office of Security and Safety Performance Assurance

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Vertical line denotes change.

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INITIATED BY:  
Office of Security and Safety  
Performance Assurance

## **NUCLEAR MATERIAL CONTROL AND ACCOUNTABILITY**

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1. PURPOSE. To establish a program for the control and accountability of nuclear materials within the U.S. Department of Energy (DOE), including the National Nuclear Security Administration (NNSA).
2. OBJECTIVES.
  - a. To prescribe DOE requirements, including those for the NNSA, for nuclear material control and accountability (MC&A) for DOE-owned and DOE-leased facilities and DOE-owned nuclear materials at other facilities that are exempt from licensing by the Nuclear Regulatory Commission (NRC).
  - b. To effect the policy in DOE P 470.1, *Integrated Safeguards and Security Management (ISSM) Policy*, by integrating nuclear materials control and accountability into DOE operations as determined by line management, and according to sound risk management practices. (DOE Policy 470.1, *Integrated Safeguards and Security Management (ISSM) Policy*, is the Department's philosophical approach to the management of the Safeguards & Security (S&S) Program. A principal objective of the ISSM Program is to integrate S&S into management and work practices at all levels, based on program line management's risk management-based decisions, so that missions may be accomplished without security events, such as interruption, disruption or compromise. This approach includes individual responsibility and implementation of the safeguards and security requirements found in this Manual.)
3. PROGRAM INTEGRATION. The Nuclear Material Control & Accountability program must be integrated with other programs such as S&S program planning and management, physical protection, protective force, information security, and personnel security. Additionally, the activities and requirements in the weapons surety, foreign visits and assignments, safety, emergency management, cyber security, intelligence, and counterintelligence programs should also be considered in the implementation of this Manual.
4. CANCELLATIONS. The directives listed below are canceled. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual obligation to comply with such a directive. Canceled directives that are incorporated by reference in a contract remain in effect until the contract is modified to delete the reference to the requirements in the canceled directives. The publication of this Manual incorporates all previous memoranda and letters that were issued by the Office of Security or its predecessor organizations that established policy.
  - a. DOE M 474.1-1B, *Manual for Control and Accountability of Nuclear Materials*, dated 6-13-03.

- b. DOE M 474.1-2A, *Nuclear Materials Management and Safeguards System Reporting and Data Submission*, dated 8-19-03.

## 5. APPLICABILITY.

- a. General. Except for exclusions listed in paragraph 5d, this Manual applies to nuclear materials at DOE-owned and DOE-leased facilities, and DOE-owned nuclear material at other facilities that are exempt from licensing by the NRC. Where a responsibility or authority is assigned to an organization that is restructured, the responsibility or authority will be reassigned to the appropriate successor organization as explicitly determined by the appropriate Departmental Element. [Pursuant to NRC NUREG/BR-0006, Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M), NRC licensees are responsible for routinely reporting all DOE-owned, -loaned, or -leased material in their possession to the Nuclear Materials Management and Safeguards System (NMMSS) as prescribed in DOE Orders. Hence, the NMMSS reporting sections of the Manual also apply indirectly to NRC licensees.]
- b. Departmental Elements. Except for exclusions listed in paragraph 5d, this Manual applies to all Departmental Elements listed on Attachment 1. This Manual automatically applies to Departmental Elements created after it is issued.

The Administrator of the National Nuclear Security Administration (NNSA) will assure that NNSA employees and contractors comply with their respective responsibilities under this Manual.

- c. Contractors.
  - (1) The Contractor Requirements Document (CRD), Attachment 2, sets forth requirements of this Manual that will apply to contractors whose contracts include the CRD. NOTE: The exclusions in 5.d. apply to contractors as well as DOE Offices.
  - (2) The CRD must be included in all contracts for DOE facilities that involve nuclear materials and contain DOE Acquisition Regulation (DEAR) clause, Title 48 Code of Federal Regulations (CFR) 952.204-2, *Security Requirements*.
  - (3) Secretarial Officers (SOs) are responsible for notifying contracting officers which contracts are affected by this Manual. Once notified, contracting officers are responsible for incorporating the CRD into the contracts of affected contractors via the laws, regulations, and DOE directives clause of the contracts.
  - (4) Regardless of the performer of the work, contractors with the CRD incorporated into their contracts are responsible for compliance with the

| CRD. Affected contractors are responsible for flowing down requirements of the CRD to subcontractors at any tier to the extent necessary to ensure compliance with the requirements.

d. Exclusions.

- (1) This Manual does not apply to DOE-owned nuclear materials at U.S. Department of Defense facilities or foreign facilities. To avoid duplicative or conflicting requirements, DOE facilities, projects, and programs that are under the cognizance of the Office of Civilian Radioactive Waste Management and are subject to NRC regulation must use the rules, standards, and criteria specified by the NRC or NRC-State agreements in lieu of this Manual. Pursuant to NRC NUREG/BR-0006, Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M), NRC licensees are responsible for routinely reporting all DOE-owned, -loaned, or -leased material in their possession to the Nuclear Materials Management and Safeguards System (NMMSS) as prescribed in DOE Orders. Hence, the NMMSS reporting sections of the Manual also apply indirectly to NRC licensees, including Department of Defense facilities licensed by NRC.
- (2) In accordance with the responsibilities and authorities assigned by Executive Order 12344 and to ensure consistency throughout the joint Navy and DOE organization of the Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors will implement and oversee all requirements and practices pertaining to this Manual for activities under the Deputy Administrator's cognizance.

6. DEVIATIONS. Deviations from requirements in this Manual must be processed in accordance with DOE M 470.4-1, *Safeguards and Security Program Planning and Management*.

7. DEFINITIONS. Terms commonly used in the program are defined in the S&S Glossary in DOE M 470.4-7, *Safeguards and Security Program References*. In addition to those in the Glossary, the following definitions are provided for use in this Manual.

- a. DOE line management refers to DOE and NNSA Federal employees who have been granted the authority to commit resources or direct the allocation of personnel or approve implementation plans and procedures in the accomplishment of specific work activities.
- b. Line management refers to DOE and NNSA Federal and contractor employees who have been granted the authority to commit resources or direct the allocation of personnel or approve implementation plans and procedures in the accomplishment of specific work activities.

- c. DOE cognizant security authority refers to DOE and NNSA Federal employees who have been granted the authority to commit security resources or direct the allocation of security personnel or approve security implementation plans and procedures in the accomplishment of specific work activities.
  - d. Cognizant security authority refers to DOE and NNSA Federal and contractor employees who have been granted the authority to commit security resources or direct the allocation of security personnel or approve security implementation plans and procedures in the accomplishment of specific work activities.
  - e. For the purposes of this Manual, the site/facility operator refers to the corporate or governmental entity responsible for the day-to-day operations involving storage, processing, or use of nuclear materials at the site/facility. For contractor-operated facilities, this refers to the site/facility contractor. For the DOE-operated facilities, this refers to the DOE organization operating the facility.
  - f. For the purposes of this Manual, the responsible Departmental Element refers to the Departmental Element with responsibility for safeguards and security of the nuclear materials to which a requirement is being applied.
  - g. For the purposes of this Manual, nuclear materials are the materials listed in Section A, Table I-1.
  - h. For the purposes of this Manual, the Office of Security refers to the DOE Office of Security and Safety Performance Assurance.
8. IMPLEMENTATION. Requirements that cannot be implemented within 6 months of the effective date of this Manual or within existing resources must be documented by the cognizant security authority and submitted to the relevant program officers; the Under Secretary for Energy, Science and Environment or the Under Secretary for Nuclear Security/Administrator, NNSA; and the Office of Security. The documentation must include timelines and resources needed to implement this Manual. The documentation must also include a description of the vulnerabilities and impacts created by the delayed implementation of the requirements.
9. CONTACT. Questions concerning this Manual should be directed to the Office of Security at (301) 903-6008.

BY ORDER OF THE SECRETARY OF ENERGY:



CLAY SELL  
Deputy Secretary

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**ATTACHMENTS**

Attachment 1 Departmental Elements to which DOE M 470.4-6 Applies

Attachment 2 Contractor Requirements Document

## **SECTION A - NUCLEAR MATERIAL CONTROL AND ACCOUNTABILITY**

### **CHAPTER I - PROGRAM ADMINISTRATION**

1. GENERAL. This Chapter provides minimum requirements for implementing a nuclear material control and accountability (MC&A) program at Department of Energy (DOE) facilities and for DOE- owned materials at other facilities that are exempt from licensing by the Nuclear Regulatory Commission (NRC). DOE line management and site/facility operators must consider MC&A requirements, systems, technologies, and activities when planning, designing, constructing, and operating new or renovated DOE facilities. The site/facility operator must use techniques and equipment that maximize material loss detection sensitivity, increase the quality of accountability measurements, minimize material holdup, and reduce the magnitude of inventory differences and associated control limits consistent with the consequences of the loss of the material.
  - a. An MC&A program must be established and maintained for all materials identified in Table I-1, Nuclear Materials. The level of control and accountability must be graded based on the consequence of their loss.
  - b. Special nuclear material (SNM) must not be received, processed, or stored at a facility until a facility approval has been granted.
  - c. MC&A programs must be designed to deter and detect theft and diversion of nuclear material by both outside and inside adversaries.
  - d. A performance testing program to verify MC&A procedures and practices and to demonstrate that material controls are effective must be established.
  - e. MC&A programs must address both the theft and diversion of SNM and the unauthorized control of a weapon, test device, or materials that can be used to make an improvised nuclear device.
  - f. This Manual requires that various documents, actions, and activities be approved by the DOE cognizant security authority.
    - (1) For each site/facility subject to the requirements of this Manual, a specific DOE cognizant security authority must be designated as the approving authority for these documents, actions and plans.
    - (2) Approval authorities may be delegated in writing to other DOE cognizant security authorities.
    - (3) The same official can be designated as the approving authority for more than one site/facility.
  - g. The site/facility operator must designate a management official to be responsible for the MC&A program. This official must be organizationally independent from

responsibility for nuclear material utilization programs, including nuclear material production, storage, processing, research, and disposition. This official must have responsibility for and the authority to ensure the safeguards of accountable nuclear material, along with operations personnel.

**Table I-1. Nuclear Materials**

Material Type	SNM, Source, or Other	Reportable Quantity*	Weight Field Used for Element	Weight Field Used for Isotope	Material Type Code
Depleted Uranium (U)	source	kilogram	total U	U-235	10
Enriched Uranium	SNM	gram	total U	U-235	20
Normal Uranium	source	kilogram	total U	—	81
Uranium-233	SNM	gram	total U	U-233	70
Plutonium-242 <sup>1</sup> (Pu)	SNM	gram	total Pu	Pu-242	40
Plutonium-239-241	SNM	gram	total Pu	Pu-239 + Pu-241	50
Plutonium-238 <sup>2</sup>	SNM	tenth of a gram	total Pu	Pu-238	83
Americium-241 <sup>3</sup> (Am)	other	gram	total Am	Am-241	44
Americium-243 <sup>3</sup>	other	gram	total Am	Am-243	45
Berkelium <sup>6</sup> (Bk)	other	microgram	—	Bk-249	47
Californium-252 (Cf)	other	microgram	—	Cf-252	48
Curium (Cm)	other	gram	total Cm	Cm-246	46
Deuterium <sup>4</sup> (D)	other	tenth of a kilogram	D <sub>2</sub> O	D <sub>2</sub>	86
Enriched Lithium (Li)	other	kilogram	total Li	Li-6	60
Neptunium-237 (Np) <sup>3</sup>	other	gram	total Np	—	82
Thorium (Th)	source	kilogram	total Th	—	88
Tritium <sup>5</sup> (H-3)	other	gram	total H-3	—	87
Uranium in Cascades	SNM	gram	total U	U-235	89

\*Reportable quantity is the minimum amount of material subject to the requirements of this Manual. Facilities with less than a reportable quantity of a material are exempt from the requirements of the manual for that material. Facilities with more than reportable quantities are to report transactions that exceed a reporting unit or more of material. Reporting unit is the mass unit that facility/site nuclear materials accounting systems must use for recording and reporting inventories and transactions.

<sup>1</sup>Report as Pu-242 if the contained Pu-242 is 20 percent or greater of total plutonium by weight; otherwise, report as Pu-239-241.

<sup>2</sup>Report as Pu-238 if the contained Pu-238 is 10 percent or greater of total plutonium by weight; otherwise, report as Pu-239-241.

<sup>3</sup>Americium and Neptunium-237 contained in plutonium as part of the natural in-growth process are not required to be accounted for or reported until separated from the plutonium.

<sup>4</sup>For deuterium in the form of heavy water, both the element and isotope weight fields will be used; otherwise, report isotope weight only.

<sup>5</sup>Tritium contained in water (H<sub>2</sub>O or D<sub>2</sub>O) used as a moderator in a nuclear reactor is not an accountable material.

<sup>6</sup>Berkelium must be accounted for at the site level. It is not required that it be reported to NMSS.

- h. A reporting identification symbol (RIS) must be established for all nuclear materials on inventory. Requirements for establishing and maintaining a RIS are detailed in Section B of this Manual.
- i. A nuclear materials representative (NMR) must be designated for each site/facility with a RIS. The NMR is to be responsible for nuclear materials

reporting and data submission to the Nuclear Materials Management and Safeguards Systems (NMMSS) (see Section B of this Manual for NMMSS reporting requirements).

- j. Authorities and responsibilities for MC&A functions (e.g., accounting system, measurements, measurement control, inventories, audit, material access controls, and surveillance) must be defined and documentation must be maintained.
- k. MC&A program implementation must facilitate, to the extent practical, the cost-effective integration of the operational mission of the program while protecting the environment, health and safety of employees, and the public.
- l. Personnel performing MC&A functions must be trained and qualified to perform their duties and responsibilities. (See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information on safeguards and security training programs.) A site-specific training program must be established, implemented and maintained. Personnel must be knowledgeable of the requirements and procedures related to their functions.
- m. An MC&A plan providing the safeguards authorization basis must be developed and maintained for each facility possessing nuclear materials. The MC&A plan must be approved by the DOE cognizant security authority.
- n. The MC&A plan must specify how nuclear material inventory holdings will be accounted for and controlled. The MC&A plan must include, at a minimum:
  - (1) the elements of the MC&A program that are designed to deter and detect loss, theft, and diversion of nuclear materials and the unauthorized control of a weapon, test device, or materials that can be used to make an improvised nuclear device;
  - (2) measures to ensure that nuclear materials are in their authorized locations and being used for their intended purposes;
  - (3) a description of the local implementation of this Manual, which must document how the MC&A program meets the requirements of this Manual;
  - (4) facility-specific requirements approved by the DOE cognizant security authority including, but not limited to, agreements between Government and contractor organizations, access control and material surveillance testing measures, and the scope and extent of the performance testing program; and
  - (5) MC&A plan review frequency and change control mechanisms.

- o. Procedures must be established by the site/facility operator for emergency conditions and periods when MC&A systems are inoperative. These measures must ensure that access to or removal of SNM would be detected during these periods. The MC&A plan must address control of SNM during emergency operations and measures to be taken before resuming operations following an emergency.
- p. Materials previously removed from inventory, for which safeguards were terminated in accordance with DOE MC&A directives in effect at the time of their removal, are exempt from the requirements of this Manual unless these materials are recovered. (Materials for which safeguards were terminated may still need to be protected and controlled pursuant to other DOE security directives based on radiological sabotage, information security, or property protection concerns. See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, DOE M 470.4-2, *Physical Protection*, and DOE M 470.4-4, *Information Security*).
- q. Termination of safeguards exempts nuclear materials from requirements of this Manual and thereby removes the safeguards basis for applying physical protection requirements for theft and diversion of nuclear material, providing termination requirements are met as specified in items (1) and (2) and below. (After safeguards termination, nuclear materials may still need to be protected and controlled pursuant to other DOE security directives based on radiological sabotage, information security, or property protection concerns. See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, DOE M 470.4-2 *Physical Protection*, and DOE M 470.4-4, *Information Security*).

Requirements for safeguards termination depend on the safeguards attractiveness levels of the material. Attractiveness levels are described in Table I-4, Graded Safeguards.

- (1) Safeguards can be terminated on nuclear materials provided the following conditions are met.
  - (a) If the material is SNM or protected as SNM, it must be attractiveness level E and have a measured value. (The second column of Table I-2, Attractiveness Level E Criteria for SNM, contains additional and more descriptive information on lower-grade forms of SNM that can be classified as attractiveness level E for purposes of terminating safeguards and/or determining appropriate levels of safeguards protection.)
  - (b) The material has been determined by DOE line management to be of no programmatic value to DOE.

The radiological sabotage risks associated with the materials have been evaluated and additional measures beyond waste management regulations put in place to ensure that protection requirements, if applicable, will be met after safeguards termination. Only nuclear materials that are of radiological sabotage concern need to be evaluated against this requirement.

- (c) The material is transferred to the control of a waste management organization where the material is accounted for and protected in accordance with waste management regulations. The material must not be collocated with other accountable nuclear materials.

**Table I-2. Additional Attractiveness Level E Criteria for SNM**

Description/Form		
	Maximum SNM concentration* (wt%) for MC&A and physical protection termination	Maximum SNM concentration* (wt%) for only physical protection equivalent to Category IV
<b>SNM solutions and oxides:</b> nitrate, caustic or chloride solutions; contaminated/impure oxides, metal fines and turnings, glove box sweepings	0.1	N/A
<b>SNM amenable to dissolution and subsequent separation:</b> pyrochemical salts; chloride melt; hydroxide cake; floor sweepings; alumina; condensates; reduction residues; sand, slag, and crucible; magnesium oxide crucibles spent fuel and spent fuel residues	0.1	0.2
<b>SNM in organic matrixes or requiring mechanical separation disassembly and subsequent multiple recovery operations:</b> HEPA filters, organic solutions, oils and sludges, graphite or carbon scrap, surface contaminated plastics, metal components, combustible rubber	0.2	1.0
<b>SNM bound in matrix of solid, sintered, or agglomerated refractory materials:</b> SNM embedded in glass or plastic, high-fired incinerator ash, spent resins, salt sludges, raffinates, and sulfides	0.5	2.0
<b>SNM microencapsulated in refractory compounds or in solid-dilution:</b> vitrified, bituminized, cemented, or polymer-encapsulated materials; SNM alloyed with refractory elements (tungsten, platinum, chromium, stainless steel); ceramic/glass salvage	1.0	5.0

\*SNM weight percent is based on element weight for plutonium and isotope weight for U-235 and U-233.

- (2) In some cases, it may be necessary to dispose of nuclear materials of attractiveness level D or higher SNM. For DOE facilities, termination of safeguards for such materials must be approved by the Departmental Element after consultation with the Office of Security. For National



Nuclear Security Administration (NNSA) facilities, termination of safeguards for such materials must be approved by the Associate Administrator for Defense Nuclear Security, after consultation with the Office of Security.

When disposal of a SNM quantity Category II or greater is being considered, a security analysis for the theft or diversion of the material must be performed. A copy of the security analysis must be provided to the responsible approving authority (i.e., the Departmental Element or the Associate Administrator for Defense Nuclear Security) before approval of safeguards termination. Conditions (1)(b) and (c), above, also apply to these materials).

- r. Reduced safeguards can be applied to materials that both meet the criteria of Table I-3, Technical Criteria for Retained Waste, and have been removed from processing material balance areas (MBAs). Such materials are referred to as retained waste. Reductions in safeguards for retained waste require the approval of the DOE cognizant security authority. The reduced requirements for retained waste materials are:
  - (1) Physical protection of retained waste must be commensurate with the safeguards category of the material as defined in Table I-4, Graded Safeguards. Protection measures against other risks, such as radiological sabotage, property protection, and information security, may still be required based on results of vulnerability assessments.

**Table I-3. Technical Criteria for Retained Waste**

<b>Description and Form</b>	<b>SNM Concentration Range (Wt %)</b>
SNM solutions and oxides	$>0.1 \leq 0.5$
SNM amenable to dissolution and subsequent separation	$>0.2 \leq 1.0$
SNM alloyed with aluminum, thorium, zirconium, spent fuel	$\leq 1.0$
SNM in organic matrixes; SNM requiring mechanical separation/disassembly and multiple recovery operations	$>1.0 \leq 5.0$
SNM bound in matrix of solid, sintered, or agglomerated refractory metals	$>2.0 \leq 7.5$
SNM microencapsulated in refractory compounds in solid-dilution	$>5.0 \leq 10.0$

- (2) Nuclear materials accountability information must remain on the site's inventory records and within NMMSS.
- (3) Physical inventory requirements including inventory measurement requirements for material identified in Table I-3, Technical Criteria for Retained Waste, can be deferred until:

- (a) the material is removed from the site; or
  - (b) the material is reintroduced into the processing MBA.
- s. Identification of a facility (building or other location where an MBA has been established) for decommissioning, closure, or deactivation does not exempt the facility from compliance with requirements stated in this Manual. The facility's MC&A program must be maintained at a level commensurate with the category and attractiveness of the nuclear material on inventory until a termination survey determines that no nuclear material remains at the facility. Such a determination may be made if no material remains or the only remaining material is waste or residual holdup that meets the definition of attractiveness level E and has been written off the MC&A books to a waste management organization. Writing the material off the books means terminating safeguards on the material (see 1.q., above). With the approval of the DOE cognizant security authority, attractiveness level E waste and residual holdup for a facility undergoing decommissioning may be written off the MC&A books to a decontamination and decommissioning organization rather than a waste management organization.

Before a facility is decommissioned, the following must be accomplished.

- (1) All nuclear material holdup must be measured and credited to the accountability books. (After holdup has been measured and properly credited to the accountability books, it can subsequently be written off the books pursuant to paragraph 1q above.) Unless demonstrated to be otherwise, the category of SNM in process holdup must be considered to be the highest category of the total SNM put into the process during its lifetime.
- (2) All nuclear material, except attractiveness level E residual holdup and waste, must be transferred to another facility, and the nuclear materials accounting inventory balance must be verified to be zero.
- (3) The termination survey must be completed.

Site/facility operators with decommissioned facilities may still need to maintain a RIS account with NMMSS. For such facilities, transfers of nuclear material in waste to and from other RIS accounts will need to be reported to NMMSS using DOE/NRC F 741/741A, *Nuclear Material Transaction Report*. With the approval of the DOE cognizant security authority, attractiveness level E waste and residual holdup for a facility undergoing decommissioning may be written off the MC&A books to a decontamination and decommissioning organization rather than a waste management organization.

- t. DOE line management must assure that technical standards developed or adopted by voluntary consensus standards bodies, such as the American Technical

Standards Institute and ASTM International, are considered in development of MC&A programs under their cognizance.

- u. MC&A systems should be integrated with physical security systems to protect against radiological and/or toxicological sabotage involving nuclear materials.
2. GRADED SAFEGUARDS. The site/facility operator must establish and follow a graded safeguards program for nuclear materials. Under the graded safeguards concept, a safeguards program must provide the greatest relative amount of control and accountability for the types and quantities of SNM that can be most effectively used in a nuclear explosive device. Table I-4, Graded Safeguards, and the following paragraphs present basic information and requirements for determining nuclear safeguards categories.
- a. Categories and attractiveness of nuclear material for implementation of DOE's graded safeguards program are shown in Table I-4, Graded Safeguards. Changes to facility safeguards categories that affect protection strategies must be reviewed and approved by the DOE cognizant security authority based on materials holdings at the facility and the credibility of rollup.
  - b. The material category of SNM locations (e.g., MBAs, material access areas (MAA), protected areas (PA), and facilities) must be determined to establish the required protection levels. In many cases, the material category is determined directly from Table I-4, Graded Safeguards. Directions for determining the material category when multiple material types and attractiveness levels must be considered are provided in the following paragraphs. Determination of category involves grouping materials by type, attractiveness level, and quantity. Material quantities are element weights for plutonium and isotope weights for uranium-235 (U-235) and uranium-233 (U-233). For the purposes of category determination, quantities of plutonium Material Type 40 and Material Type 50 should be combined and considered as one material type.
    - (1) One Material Type, One Attractiveness Level. Sum the material in the attractiveness level and determine the category from Table I-4, Graded Safeguards.
    - (2) One Material Type, Multiple Attractiveness Levels (where a Category III or greater quantity of B-level material is included).
      - (a) Determine the amounts of SNM for materials in each of attractiveness levels B, C, and D.
      - (b) Calculate the "effective" quantity for attractiveness levels B and C by multiplying the quantity in attractiveness levels B and C by the appropriate factors in Table I-5, Effective Quantities.

- (c) Sum the effective amounts in attractiveness levels B and C.
      - (d) Compare the total effective amount, as calculated in paragraph 2.b.(2)(c) above, to the amounts in attractiveness level B from Table I-4, Graded Safeguards.
      - (e) Compare the amount of attractiveness level D to Table I-4, Graded Safeguards.
      - (f) The material category is the highest level of material category determined using the procedures in paragraphs 2b(2)(a) through 2b(2)(d) or in paragraph 2b(2)(e).
    - (3) One Material Type, Multiple Attractiveness Levels (where less than a Category III quantity of B-level material is included).
      - (a) Determine the amounts of SNM for all attractiveness levels.
      - (b) Compare the total amounts in each level to those in Table I-4, Graded Safeguards.
      - (c) The material category level is the highest level of the material categories determined using the procedures in paragraphs 2b(3)(a) and 2b(3)(b).
    - (4) Multiple Material Types.
      - (a) Determine the category for each material type following the above procedures.
      - (b) The category is that determined for the individual material type that requires the highest level of protection.
  - c. Roll-up is the accumulation of smaller quantities of SNM to a higher category, based upon a compliance standard using Table I-4, Graded Safeguards. Unless it has been demonstrated by a vulnerability assessment that roll-up is not credible, SNM must be safeguarded and protected based on the total quantity of SNM for a location (e.g., MAA, PA, building, or group of buildings.)
3. MC&A REQUIREMENTS FOR SOURCE AND OTHER NUCLEAR MATERIALS.
- a. Separated neptunium-237 and separated americium (Am-241 and Am-243) must be protected, controlled, and accounted for as if they were SNM. For the purposes of this Manual, separated neptunium-237 and separated americium, refer to the recovered or product material generated from chemical and processing operations on the target/source material.

**Table I-4. Graded Safeguards**

	Attractiveness Level	Pu/U-233 Category (kg)				Contained U-235/Separated Np-237/Separated Am-241 and -243 Category (kg)				All E Materials Category IV
		I	II	III	IV <sup>1</sup>	I	II	III	IV <sup>1</sup>	
<b>WEAPONS</b> Assembled weapons and test devices	A	All	N/A	N/A	N/A	All	N/A	N/A	N/A	N/A
<b>PURE PRODUCTS</b> Pits, major components, button ingots, recastable metal, directly convertible materials	B	≥2	≥0.4<2	≥0.2<0.4	<0.2	≥5	≥1<5	≥0.4<1	<0.4	N/A
<b>HIGH-GRADE MATERIALS</b> Carbides, oxides, nitrates, solutions (≥25 g/L) etc.; fuel elements and assemblies; alloys and mixtures; UF <sub>4</sub> or UF <sub>6</sub> (≥ 50% enriched)	C	≥6	≥2<6	≥0.4<2	<0.4	≥20	≥6<20	≥2<6	<2	N/A
<b>LOW-GRADE MATERIALS</b> Solutions (1 to 25 g/L), process residues requiring extensive reprocessing; moderately irradiated material; Pu-238 (except waste); UF <sub>4</sub> or UF <sub>6</sub> (≥ 20% < 50% enriched)	D	N/A	≥16	≥3<16	<3	N/A	≥50	≥8<50	<8	N/A
<b>ALL OTHER MATERIALS</b> Highly irradiated forms, solutions (<1 g/L), uranium containing <20% U-235 or <10% U-233 <sup>2</sup> (any form, any quantity)	E	N/A	N/A	N/A	Reportable Quantities	N/A	N/A	N/A	Reportable Quantities	Reportable Quantities

<sup>1</sup>The lower limit for Category IV is equal to reportable quantities in this Manual.

<sup>2</sup>The total quantity of U-233 = [Contained U-233 + Contained U-235]. The category is determined by using the Pu/U-233 side of this table.

**Table I-5. Effective Quantities**

Attractiveness Level	Pu/U-233 Factor	U-235 Factor
B	1	1
C	$\frac{1}{3}$	$\frac{1}{4}$

- (1) Departmental protection program strategies and graded safeguards thresholds for separated neptunium-237 and separated americium are to be identical to those for U-235. The category for these isotopes is determined using the U-235 side of Table I-4, Graded Safeguards.
  - (2) Americium and neptunium-237 contained in plutonium as part of the natural in-growth process are not required to be controlled, accounted for, or reported until separated from the plutonium.
- b. Tritium is a nuclear material of strategic importance; therefore, a graded safeguards programs for tritium must be implemented according to the following categorizations.
- (1) Category III. Weapons or test components containing reportable quantities of tritium, deuterium-tritium mixtures, or metal tritides that can be easily decomposed to tritium gas, containing greater than 50 grams of tritium (isotope) with a tritium isotopic fraction of 20 percent or greater.
  - (2) Category IV. All other reportable quantities, isotopic fractions, types, and forms of tritium.
- c. Excluding tritium, separated neptunium-237, and separated americium (Am-241 and Am-243), source and other nuclear materials listed in Table I-1, Nuclear Materials, are exempt from the requirements of this Manual except for the following:
- (1) An MC&A program must be established and maintained for these materials based on the strategic and monetary value of the materials.
  - (2) Data fields used in the materials accounting system must be consistent with Table I-1, Nuclear Materials.
  - (3) Nuclear materials inventories and transactions must be documented in the nuclear materials accounting at a level specified by the DOE cognizant security authority. At a minimum, all RIS-level inventories and transactions must be documented by the system.
  - (4) RIS level transactions and inventories must be reported to NMMSS in accordance with Section B of this Manual. Transactions and inventories for Berkelium are excluded from this requirement and do not need to be

reported to NMMSS; however, accounting for Berkelium will be maintained at the facility level.

- (5) When these materials are potential substitution materials for SNM and are collocated with SNM, the requirements of Section A, II, 3.a.(2), Physical Inventory Frequencies, of this Manual apply.
- (6) The frequency and manner of conducting physical inventories must be approved by the DOE cognizant security authority and documented in the site/facility MC&A plan.
- (7) Other MC&A requirements are to be determined by the DOE cognizant security authority and documented in the site/facility MC&A plan or other MC&A program documents.

4. LOSS DETECTION EVALUATION, PERFORMANCE TESTING, AND PERFORMANCE REQUIREMENTS.

- a. Loss Detection Evaluation. An assessment program for identifying and evaluating facility capability to detect the loss of Category I quantities of SNM must be developed for each Category I facility. Potential targets must include all Category I and any other areas for which a credible scenario for unauthorized accumulation of a Category I quantity of SNM have been identified. Vulnerability assessments must be approved by the DOE cognizant security authority and must be reviewed annually (at least every 12 months) and updated when there are system changes or new information indicates a potentially significant change in the risk of unauthorized removal of SNM. Results of the reviews, including changes in the vulnerability assessments, must be reflected in the vulnerability analyses reports. (See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information on vulnerability assessment programs.)
- b. Performance Testing. MC&A performance testing programs must be developed and documented to support and verify loss detection capability and system effectiveness. (See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information on performance testing programs.) The scope and intent of performance testing must be based on the graded safeguards concept, i.e., the testing program demonstrates greater testing for higher category facilities than for lower category facilities, with Category I defined as highest and Category IV as lowest.
  - (1) Performance tests must be designed to demonstrate that the MC&A system is functional and to ensure that the system performs as specified or required. In addition, the site/facility operator for the facilities must:

- (a) identify those system components that provide the greatest effectiveness against theft and diversion;
    - (b) design, conduct, and document tests that substantiate component effectiveness; and
    - (c) integrate the results of these component tests into S&S risk management programs and vulnerability assessments.
  - (2) The performance testing program must include those elements that can detect a threat in time to prevent it and those elements that can effectively account for SNM to detect material loss and ensure that safeguards and security systems are functioning properly. The performance testing program design must also focus on testing individual detection elements. Elements identified in a vulnerability assessment that contribute to detection capability must be tested on a frequency that is based on the level of risk.
  - (3) Performance testing must include testing to determine whether S&S systems have failed, including testing for loss of SNM. The accuracy of the accounting system and its capability to provide information about the quantity, location, and identifying characteristics of nuclear material, must be tested.
  - (4) Corrective action plans for systems that have failed performance testing must be developed and interim compensatory measures put in place.
- c. MC&A Performance Requirements. Specific performance requirements for selected MC&A system elements are established below in (1)-(7). The performance of the selected system elements must be validated on a frequency documented in the MC&A plan. If system elements fail to meet the performance requirements, a corrective action plan must be developed and, where necessary, compensatory measures must be taken.
- (1) Access controls. Performance tests must be designed and conducted to evaluate the effectiveness of access controls for Category I and II quantities of SNM.
    - (a) At least 95 percent of the tests conducted must demonstrate detection of unauthorized access to Category I and II quantities of SNM.
    - (b) Testing of access controls must be facility-specific, and the scope and the extent of the testing must be documented by the site/facility operator and approved by the DOE cognizant security authority.



- (2) Material Surveillance. Performance tests must be designed and conducted to evaluate the effectiveness of material surveillance activities for Category I and II quantities of SNM.
  - (a) At least 95 percent of the tests conducted must demonstrate detection of unauthorized actions related to the control of Category I and II quantities of SNM.
  - (b) Material surveillance testing must be facility-specific, and the scope and the extent of the testing must be documented by the site/facility operator and approved by the DOE cognizant security authority.
- (3) Tamper-Indicating Devices (TIDs). The TID record system must accurately reflect the location and identity of TIDs for at least 99 percent of the TIDs inspected. The TID program must ensure that TIDs are properly in place for at least 95 percent of the TIDs inspected.
  - (a) To comply with the TID performance requirement, TIDs must be inspected for all items selected for physical inventory and/or transfer.
  - (b) Testing to ensure TIDs are properly in place must include checking to see that the TID has been properly applied and the integrity of the TID has not been violated.
  - (c) Performance must be verified at least annually (at least every 12 months) except for facilities whose physical inventories are conducted less frequently than once a year. For such facilities, performance must be verified at the same frequency as inventories are conducted.
  - (d) Testing for this requirement is not intended to require destruction of properly applied TIDs whose integrity has not been violated.
- (4) SNM and Metal Portal Monitoring. Performance testing requirements must include those necessary to verify vulnerability assessments, detection requirements, and applicable tests described in ASTM International Standard Guides.
- (5) Accounting Record Systems. The accounting record system must accurately reflect item identity and location for at least 99 percent of items selected. If more than 1 percent of the accounting records selected are found to be in error, corrective actions must be taken for the accounting system as a whole.

- (a) Accounting record systems must be verified against all items selected for physical inventory and/or transfer.
  - (b) Performance must be verified at least annually (at least every 12 months) except for facilities whose physical inventories are conducted less frequently than once a year. For such facilities, performance must be verified at the same frequency as inventories are conducted.
- (6) Confirmation/Verification Measurements. For Category I and II items, acceptance/rejection criteria for verification measurements and, where possible, for confirmatory measurements, must be based on the standard deviation for the measurement method under operating conditions. Control limits for such criteria must be set at no wider than three times the standard deviation for the method. The control limits must be reviewed and approved by the DOE cognizant security authority
- (7) Inventory Difference Control Limits.
- (a) For Category I and II MBAs, limits-of-error must not exceed 2 percent of the active inventory during the inventory period or a Category II quantity of material.
  - (b) For Category III and IV MBAs, limits-of-error of inventory differences must not exceed a specified percentage of the active inventory during the inventory period to a maximum of a specified quantity; the specified percentage and maximum quantity must be approved by the DOE cognizant security authority.
  - (c) For purposes of the performances requirements (a) and (b), the term “active inventory” means the sum of additions to inventory, beginning inventory, ending inventory, inventory adjustments, and removals from inventory after all “common terms” have been excluded (in this context, “common terms” are material values that appear in the active inventory calculation more than once and come from the same measurement).

5. REPORTING INCIDENTS OF SECURITY CONCERN.

- a. The site/facility operator must identify MC&A loss detection elements for each MBA and must establish a graded program for monitoring these elements and associated data to determine the status of nuclear material inventories and to identify security incidents. (See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information on reporting security incidents.)

- b. In addition, the DOE cognizant security authority must independently evaluate the significance of the incident. Information and actions related to loss detection, monitoring, and assessment activities must be documented and maintained.

6. ASSESSMENT PROGRAMS.

- a. General. The site/facility operator must establish a program to periodically review and assess the integrity and quality of its MC&A program and practices. The assessment program must address both normal operations and emergency conditions. The frequency and content of these assessments must be on a graded basis approved by the DOE cognizant security authority. (See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information on safeguards and security assessment programs.) The results of all assessments must be reported to the DOE cognizant security authority, and assessment reports must be reviewed for classification. Deficiencies must be identified and corrective action plans developed. The assessment must be performed by personnel who are knowledgeable of MC&A.

Reviews must be conducted and documented before startup of new facilities or operations and when changes occur in facilities, operations, or MC&A features that might alter the performance of the MC&A system.

- b. Assessment Program Elements. At a minimum, the assessment program must address the following.
  - (1) Identification of abnormal situations.
  - (2) Loss mechanisms, loss detection capabilities, and localization of inventory differences.
  - (3) Selection, maintenance, calibration, and testing functions to ensure proper equipment and system performance.
  - (4) MC&A system checks and balances, including separation of responsibilities and duties, used to identify irregularities and detect tampering with materials or MC&A system components.
  - (5) Change controls, including authorization requirements, to detect unauthorized or inappropriate modification of system components, procedures, or data. The change control system must address requirements for review, authorization, documentation, notification, and controls on equipment selection, procurement, and maintenance.
  - (6) Procedures or checks to ensure the reliability and accuracy of MC&A data and information.

- (7) Performance testing conducted by the site/facility operator. This portion of the assessment should address the design of performance tests and the results obtained by the testing program since the last assessment.
  - (8) Procedures for emergency conditions and for periods when MC&A system components are inoperative.
  - (9) Material containment, material access, and material surveillance procedures.
  - (10) Physical inventory program and reconciliation practices.
  - (11) Accounting system procedures, capabilities, and sensitivities.
  - (12) Identification of personnel with MC&A responsibilities who should be included in the facility human reliability program, (See 10 Code of Federal Regulations 712, *Human Reliability Program*, for additional information.)
  - (13) Measurement control program.
  - (14) TID programs.
- c. Independent Assessments. In addition to the assessments described above, an organization independent of MC&A must conduct internal audits of the facility's MC&A function to assess compliance with internal plans and procedures. The frequency of these audits must be approved by the DOE cognizant security authority.
- d. DOE-Material at NRC Licensees' Sites.
- (1) DOE programs offices with responsibility for DOE-owned nuclear materials at NRC licensees' sites must obtain written verification that the licensee continues to possess the materials and verify that the NMMSS records are correct for these materials. The verifications must be obtained at least every 12 months but are not required for materials that have already been identified in the licensee's most recent material balance report provided the report was submitted to NMMSS within the last 12 months. The verifications may be obtained directly by the program office or by their site offices.
  - (2) For DOE-owned materials at NRC licensees' sites for which no DOE programmatic owner has been assigned, Office of Resource Management, Office of Security and Safety Performance Assurance, must obtain written verification that the licensee continues to possess the materials and verify that the NMMSS records are correct for these materials. The verifications must be obtained at least every 12 months but are not required for

materials that have already been identified in the licensee's most recent material balance report provided the report was submitted to NMMSS within the last 12 months.

## CHAPTER II - MATERIALS ACCOUNTABILITY

1. GENERAL. This Chapter describes requirements for nuclear materials accountability. Nuclear material accountability programs must ensure accountable nuclear materials are accounted for and unauthorized acts are detected. These requirements must be applied in a manner consistent with the graded safeguards concept. The Chapter is divided into five functional areas: accounting systems, physical inventories, measurement and measurement control, nuclear material transfers, and material control indicators.
2. ACCOUNTING SYSTEMS. A system for tracking nuclear material inventories, documenting nuclear material transactions, issuing periodic reports, and assisting with the detection of unauthorized system access, data falsification, and material gains or losses must be established and implemented. The accounting system must provide a complete audit trail for all nuclear material from receipt through disposition. The generally accepted accounting principles promulgated by the Financial Accounting Standards Board must be used in the design and operation of the nuclear material accounting system.

The facility nuclear materials accounting system must include checks and balances and must be structured to ensure timely detection of errors or discrepancies in records associated with a Category I or II quantity of SNM, including, where possible, detecting falsified data and identifying the responsible persons. Timeframes for detection of errors and discrepancies must be approved by the DOE cognizant security authority and documented in the MC&A plan. The system also must be capable of detecting omissions and other data discrepancies and ensuring completeness of accounting records.

- a. Accounting Systems Databases and Procedures. Procedures must be established and maintained that describe the structure and operation of the nuclear materials accounting system. The procedures must accurately reflect current nuclear material accounting practices. Specific requirements for accounting procedures must include the following.
  - (1) Descriptions of the inventory database (including procedures for updating and reconciling inventory data with the results of physical inventories) and the required data elements for each applicable material type.
  - (2) Identification of accounting reports and their frequency, distribution, and timeliness, consistent with accounting requirements.
  - (3) Identification of organizational responsibilities for management and operation of the accounting system.
  - (4) Recording, reporting, and submitting data to the NMMSS, by material type and reporting unit, as specified in Section B of this Manual.

b. Account Structure.

- (1) Facility nuclear material accounts must consist of one or more MBAs established to identify the location and quantity of nuclear materials in the facility. Readily retrievable accountability data must be maintained by MBA and reflect quantities of nuclear materials inventory, quantities of nuclear materials received and shipped, and other adjustments to inventory.
- (2) The MBA account structure must sort data by material types, processes, and functions; provide the capability to localize inventory differences; and provide a system of checks and balances for verifying the accuracy of the accountability data and records.
- (3) An MBA boundary must not cross an MAA boundary. Each MBA must consist of a single geographical area and be an integral operation.
- (4) The site/facility operator must designate an MBA custodian for each MBA to ensure that MC&A requirements are implemented in that MBA.
- (5) The MBA custodian is responsible for controlling nuclear material located in the MBA, preparing and signing internal material transfer documents, and conducting and reconciling MBA physical inventories.
- (6) An MBA custodian must not be responsible for multiple MBAs when transfers of nuclear material occur between those MBAs (i.e., a single custodian must not serve as both shipper and receiver for material transfers).

c. Records and Reports.

- (1) The site/facility operator must maintain records, submit data, and issue reports as required by this Manual and facility procedures. The reports must accurately describe all nuclear material transactions and inventories. Inventory adjustments must be identified by MBA and must be reported as required in this Manual.
- (2) Nuclear materials records must be updated by authorized personnel only. The records system must provide an audit trail for all transactions affecting the nuclear materials database.
- (3) The accounting records system must be capable of being updated daily or on demand for all nuclear materials transactions. This requirement is for updating records based on reports or information; it does not pertain to how quickly a facility must be able to complete measurements. The records system must also be capable of generating electronic and/or hard

copy book inventory listings of all SNM within 3 hours. The listing must differentiate between SNM and other nuclear material when necessary. The accuracy of the accounting record system must be validated in accordance with requirements of Section A, Chapter I, paragraph 4b, of this Manual. Specific performance requirements for accounting record system accuracy are contained in Chapter I, paragraph 4c.

3. PHYSICAL INVENTORIES. The site/facility operator must implement a physical inventory program for nuclear materials to demonstrate that materials are present in their stated quantities and to detect the unauthorized removal of nuclear materials. Inventory requirements for separated Np-237 and separated americium are the same as for SNM. When facilities are precluded from performing physical inventories as required by this Manual, material control and protection features must be enhanced to ensure inventory integrity. Physical inventory programs must comply with the following requirements.
  - a. Periodic Physical Inventories. Periodic and special physical inventories must be performed for each MBA according to the strategic importance of the material and the consequence of its loss.
    - (1) Conduct of Physical Inventories. Inventories must be based on measured values, including measurements or technically justifiable estimates of holdup. Process monitoring techniques may be used for material that is undergoing processing and recovery operations and is inaccessible for measurements. Plans and procedures must be developed and documented that define responsibilities for performing inventories and specify criteria for conducting, verifying, and reconciling inventories. Statistical sampling, based on graded safeguards, may be used to verify the presence of items during inventories. Parameters for statistical sampling plans must be defined by the site/facility operator, and approved by the DOE cognizant security authority. Sampling plans must specify the population, confidence level, minimum detectable defect, definition of a defect, and action to be taken if a defect is encountered.

Table II-1, Minimum Sampling Parameters for Physical Inventories, provides minimum sampling parameters for safeguards categories.

**Table II-1. Minimum Sampling Parameters for Physical Inventories**

Category	Confidence Level	Minimum Detectable Defect
I	95 percent	3 percent
II	95 percent	5 percent
III & IV	95 percent	10 percent

The inventory population must be stratified according to item category as shown in Table II-1, Minimum Sampling Parameters for Physical



Inventories. Separate samples must be derived for each inventory stratum.

- (2) Physical Inventory Frequencies. Physical inventories must be performed for Category I and II MBAs that involve activities other than processing at a frequency determined by the DOE cognizant security authority but at least semiannually (once every 6 months). The site/facility operator must ensure that physical inventories are performed bimonthly (once every 2 months) in Category I and II MBAs where processing occurs.

In processing areas where process controls provide equivalent levels of theft and diversion detection, physical inventories may be performed upon completion of the material campaign. In such cases, the DOE cognizant security authority must approve a processing plan before starting the campaign. The process plan must identify compositions and quantities of material to be processed, projected processing timetable, process control measures used, and procedures necessary for material controls during process interruptions. Other factors to be considered for frequency determination include personnel radiation exposure, the operational mode of the facility, and credible protracted diversion scenarios.

At least annually, each facility must perform a simultaneous physical inventory of all Category I and II MBAs for which the established inventory frequency is annual or more frequent. MBAs with extended inventory frequencies of greater than 1 year are excluded from this requirement.

Physical inventories for Category III and IV SNM MBAs must be performed at a frequency specified by the DOE cognizant security authority, but at least every 2 years (every 24 months).

Category IV source and other nuclear material in Category I and II MBAs must be inventoried at least every 2 years (every 24 months), except when the source and/or other nuclear material is a credible substitution material.

When source or other nuclear materials are credible substitution materials for SNM and are collocated with SNM, facilities must inventory substitution materials with the same frequency as the SNM and use inventory measurement methods that can distinguish between SNM, source, and other nuclear material.

Except for materials required to be protected as SNM and potential substitution materials collocated with SNM, source and other materials outside Category I and II MBAs must be inventoried at a frequency approved by the DOE cognizant security authority and as documented in the MC&A plan.

In addition to the requirements listed above, inventory checks for Category IA items not in storage must be performed weekly for physical count verification and monthly for serial number verification. Inventory checks for stored Category IA items must consist of a physical count whenever the storage area is accessed and a monthly serial number verification.

- (3) Extensions to Inventory Frequency Requirements. Extensions to inventory frequencies must be approved by the DOE cognizant security authority in accordance with the alternative inventory control provisions in Table II-2, Inventory Periods Based on Alternative Measures for Category I and II Storage Locations. For Category I and II storage areas, Table II-2 may be used to determine the frequency of physical inventories based on the successful implementation of alternative inventory control measures. Inventory periods specified for each alternative measure are additive so long as the measures function independently.

Total inventory extension is equal to the sum of inventory periods for all alternative measures used, with a maximum allowable period of 5 years (60 months). The longest inventory extensions are given for measures that provide material attribute information. Items added to these storage areas must have appropriately measured values. If inventory extensions are granted for Category I or II storage areas other than in accordance with the provisions of Table II-2, a deviation must be submitted. (See DOE M 470.4-1 for additional information on submission of deviations.) The DOE cognizant security authority may extend inventory periods beyond 2 years (24 months), with a maximum inventory period of 5 years (60 months), for Category III and IV storage areas that have alternative inventory control measures.

Inventory values must be determined by the site/facility operator in time to complete inventory computation and reconciliation and to determine inventory differences within DOE reporting requirements as specified in this Manual and based on approved inventory frequencies.

- (4) Physical Inventory Reconciliation Program. A physical inventory reconciliation program must be implemented in which the book inventory for each MBA is compared with, and if necessary, adjusted to the physical inventory. The reconciliation must be completed within 15 calendar days following receipt of all inventory information, measurement data, and sample analyses. Any inventory differences must be identified and reported as required.

- b. Special Inventories. Procedures must be established and implemented for conducting special inventories at the request of authorized facility personnel, the DOE cognizant security authority, or as a result of routine disassembly of critical

assemblies, changes in custodial responsibilities, missing items, inventory differences exceeding established control limits, and abnormal occurrences.

**Table II-2. Inventory Periods Based on Alternative Measures  
for Category I and II Storage Locations**

<b>Alternative Inventory Control Measures<sup>1</sup></b>	<b>Inventory Periods</b>
Formidable barriers	1 year
Hazardous environment	1 year
Bulk containment	1 year
Vault enhancement above baseline requirements	9 months
Continuous monitoring of physical or mechanical parameters	1 year
General (area-wide) confirmatory measurements	1 year
Continuous item observation (e.g., video/image, laser surveillance)	2 years
Continuous item monitoring (e.g., monitoring of serial number, TIDs, movement)	2 years
Mass (load cell)	2 years
Confirmatory measurements on individual items (e.g., thermal, gamma, or neutron emission)	3 years
Quantitative measurements on individual items	May qualify as a continuous inventory <sup>2</sup>

<sup>1</sup>When multiple measures are used for storage MBAs, the inventory periods are additive as long as the alternative measures function independently.

<sup>2</sup>If the measurements are both item- and material-specific and there is a level of confidence that the measurements are correct, the monitoring may qualify as a continuous physical inventory. To be considered a continuous physical inventory, automated measurements must be made on all items on a second-to-second basis.

c. IAEA Inventories. Physical inventories performed during IAEA inspections may, with the concurrence of the DOE cognizant security authority, serve in place of a scheduled physical inventory.

d. Inventory Verification/Confirmation Measurements.

- (1) A system for performing measurements as part of a physical inventory must be established and implemented by the site/facility operator for each MBA. Verification measurements must be made on SNM items that are not tamper-indicating. Verification measurements must also be made on tamper-indicating items that are not under an effective materials surveillance program. To be regarded as effective for the purposes of this requirement, material surveillance programs must meet the requirements of Chapter III, paragraph 3. Such measurements may use a statistically based sampling plan applied in a manner consistent with the graded safeguards concept. The site/facility operator must develop sampling plans, which the DOE cognizant security authority must approve. These plans must be based on the defined population and must not be a subset of the sample selected for physical inventory. Sampling plans must specify

the population, confidence level, minimum detectable defect, definition of a defect, and action to be taken if a defect is encountered. Minimum sampling parameters for safeguards categories are as noted in Table II-3, Minimum Sampling Parameters for Verification/Confirmation Measurements.

The inventory population must be stratified according to item category, as shown in Table II-3, Minimum Sampling Parameters for Verification/Confirmation Measurements. Separate samples must be derived for each stratum.

**Table II-3 Minimum Sampling Parameters for  
Verification/Confirmation Measurements**

Category	Confidence Level	Minimum Detectable Defect
I	95 percent	3 percent
II	95 percent	5 percent
III & IV	95 percent	10 percent

The DOE cognizant security authority may establish a material quantity threshold for requiring inventory verification and confirmation measurements. For materials not amenable to verification measurement, confirmatory measurements of two material attributes must be substituted for verification measurements. Materials not amenable to verification measurement must be identified and documented in the MC&A plan.

- (2) The site/facility operator must establish documented acceptance or rejection criteria for inventory confirmation and verification measurements based on valid technical and statistical principles. For Category I and II items, acceptance and rejection criteria must be consistent with performance requirements for confirmation and verification measurements shown in Chapter I, paragraph 4c. The site/facility operator must prepare and implement a response plan for evaluating and resolving all verification and confirmation measurements that fail to meet acceptance criteria. Items that fail to meet the confirmation or verification measurement acceptance criteria must not be processed before the discrepancy is resolved.

4. MEASUREMENT AND MEASUREMENT CONTROL. Measurement and measurement control programs approved by the DOE cognizant security authority must be implemented at all facilities with nuclear material. Measurement programs used to determine Category I or II inventories of SNM or used to determine a Category I or II SNM throughput over a 6-month period must meet the requirements set forth in paragraphs 4a-4e, below. All measurement systems used for accountability purposes must have associated measurement control programs to ensure the quality of measurement data generated.

Measurement programs used to determine Category III or IV inventories of SNM must address the topics set forth in paragraphs 4a-4e, below, but the specific measurement and measurement control requirements will be determined by the DOE cognizant security authority.

Measurement systems used for accountability purposes must be precise and accurate enough to minimize the contribution of measurement error to the limit of error of the inventory difference. Nuclear materials not amenable to verification measurement must be identified in the facility's MC&A plan. Inventory values for these materials must be based on measured values or technically justified estimates. Justification and supporting documentation for these inventory values must be maintained and readily retrievable for review.

- a. Organization. Measurement and measurement control programs must be independent from operations.
- b. Selection and Qualification of Measurement Methods. The site/facility operator must select, qualify, and validate measurement methods capable of providing the required levels of precision and accuracy. Target values for precision and accuracy of nuclear material measurements endorsed by recognized national and international nuclear organizations must be considered performance goals for facility measurement systems. Alternative measurement performance goals must be defensible and documented. Precision and accuracy requirements must be approved by the DOE cognizant security authority and documented in the MC&A plan. Procedures must be documented and implemented for each facility to ensure that only qualified measurement methods are used for accountability purposes.
- c. Training and Qualification of Measurement Personnel. Individuals responsible for performing nuclear material measurements must have sufficient knowledge to perform the measurements in an acceptable manner.
  - (1) Training. A documented plan for training measurement personnel must be established and implemented for each facility. The plan must be reviewed annually (at least every 12 months) and updated as necessary to reflect changes in measurement technology and must specify training qualification and re-qualification requirements for each measurement method.
  - (2) Qualification. A documented qualification program must be established and implemented for each facility to ensure that measurement personnel demonstrate acceptable levels of proficiency before performing measurements and that measurement personnel are re-qualified according to requirements in the training plan. Measurement personnel must demonstrate proficiency in destructive analysis of nuclear material at a minimum of once per day for each method they will use that day.

- d. Measurement Systems. Nuclear material measurement systems must provide accurate nuclear material values for inventories and transactions.
  - (1) Sampling. Sampling programs must be implemented to ensure that portions of bulk material taken for measurement are representative of the bulk material. The site/facility operator must establish and implement a documented sampling plan for each measurement point used for accountability purposes. The plans must be based on valid technical and statistical principles and must take into account material type, measurement requirements, and any special process or operational considerations.
    - (a) The basis for the sampling plan must be documented and validated through studies of the materials or items being sampled.
    - (b) The sampling plan must specify, at a minimum, the sampling procedure, number and size of required samples, mixing time and procedure (when applicable), provisions for retaining archive samples, and estimates of variance associated with the sampling method.
    - (c) Sampling procedures must be documented and reviewed annually (at least every 12 months) or whenever changes are made, including changes to the type or composition of the material being sampled.
  - (2) Measurement Methods. The site/facility operator must develop, document, and maintain measurement methods for all nuclear material on inventory. These methods must be written to provide clear direction to the analyst or operator and must be validated initially and revalidated whenever changes are made.
    - (a) In determining inventory values and consistent with the graded safeguards concept, measurement methods must be selected in a manner that minimizes the contribution of measurement error to the uncertainty of the inventory difference.
    - (b) Verification measurements, when used to adjust accountability records, must have accuracy and precision comparable to or better than the original measurement method.
    - (c) The method used for confirmatory measurements must be capable of determining the presence or absence of a specific attribute of the material consistent with valid acceptance and rejection criteria.

- (d) All measurement methods must be calibrated using standard or certified reference materials or secondary standards traceable to the national measurement base and must be revalidated as necessary.
  - (e) Measurement equipment and instruments must meet precision and accuracy requirements under in-plant conditions.
  - (f) Documentation of measurement data must be maintained to provide an audit trail from source data to accounting records.
- e. Measurement Control Programs. The site/facility operator must develop and implement control programs for all measurement systems used for accountability purposes. Control programs must ensure the effectiveness of measurement systems and the quality of measured values used for accountability purposes. Control programs must also produce precision and accuracy values for use in determining inventory difference control limits and shipper/receiver limits of error. A measurement control program, as referred to herein, must include, at a minimum, the following elements.
  - (1) Scales and Balances Program. All scales and balances used for accountability purposes must be maintained in good working condition, recalibrated according to an established schedule, and checked for accuracy and linearity on each day that the scale or balance is used for accountability purposes.
  - (2) Analytical Quality Control. Data from routine measurements must be analyzed statistically to determine and ensure accuracy and precision of the measurements.
  - (3) Sampling Variability. The uncertainty associated with each sampling method, or combination of sampling and measurement methods, must be determined and maintained on a current basis.
  - (4) Physical Measurement Control. The precision and accuracy of volume, temperature, pressure, and density measurements must be determined and ensured.
  - (5) Instrument Calibration. Instruments must be calibrated using appropriate standards, when available. At a minimum, measurement values must be compared with more accurate measurement system values on a prescribed basis; the frequency is defined by demonstrated instrument performance.
  - (6) Reference Materials (Standards). All calibration and working standards used in a measurement control program must be traceable to the national measurement base through the use of standard reference materials or

certified reference materials. They must have smaller uncertainties associated with their reference values than the uncertainties of the measurement method in which they are used. Working standards used in a measurement control program must be representative of the type and composition of the material being measured when the material matrix affects the measured values.

- (7) Sample Exchange Programs. Each facility's measurement control program must include participation in interlaboratory control programs to provide independent verification of internal analytical quality control.
- (8) Statistical Controls. For each measurement method used for accountability purposes, control limits must be calculated and monitored, and documented procedures must exist to correct out-of-limits conditions. Control limits must be established at the two-Sigma level (warning limits) and three-Sigma level (alarm limits). Control data exceeding the two-Sigma limits must be investigated, and when warranted, corrective action must be taken. If a single data point exceeds the three-Sigma level, the measurement system in question must not be used for an accountability measurement until the measurement system has been demonstrated to be within statistical control. For measurement methods relying substantially on operator technique, control limits must include uncertainties for each analyst/method combination. Statistical control limits must be monitored to ensure they are consistent with target values as approved in the MC&A plan.
- (9) Measurement Method Qualification. The site/facility operator must have a documented measurement method qualification program. The qualified measurement methods must demonstrate acceptable performance before being used for accountability purposes. For destructive analysis and nondestructive assay of nuclear material, performance must be demonstrated at least once per day for each method being used. For nondestructive analysis measurement systems for which meeting this requirement is impractical or unnecessary, the control measurement frequency must be at least one of every five measurements unless otherwise approved by the DOE cognizant security authority.
- (10) Measurement Control Procedures. The site/facility operator must develop and document measurement control procedures for all measurement methods used for accountability. The site/facility operator must develop and implement a program for each facility to ensure measurement control procedures are followed.
- (11) Statistical Programs. The site/facility operator must develop and implement a documented program for the statistical evaluation of measurement data to determine control limits and precision and accuracy



levels for each measurement system used for accountability. The program must ensure the quality of measurement and measurement control data and provide estimates of uncertainty on inventory and inventory control statements.

The statistical program, at a minimum, must contain the following elements.

- (a) Valid statistical techniques to determine the total random error, the measurement biases generated for each measurement system or sampling/measurement system, and the control limits, rejection limits, and outlier criteria.
- (b) A valid statistical technique to develop sampling plans for inventory and measurement of nuclear material.
- (c) Analysis of measurement control data and reporting to the responsible organization at specified times and frequencies.
- (d) Documentation of all major assumptions made in each data evaluation process.

5. NUCLEAR MATERIAL TRANSFERS. The site/facility operator must develop and implement a program to control and account for both internal and external transfers of nuclear materials for each facility. This program must include documented procedures that specify requirements for authorization, documentation, tracking, verification, and response to abnormal situations that may occur during transfer of nuclear materials. The site/facility operator must establish and implement a graded system of measurements and records to monitor internal and external transfers of nuclear material and to deter/detect unauthorized removal of material during such transfers (see Section B of this Manual for requirements for submitting DOE/NRC F 741 and DOE forms required for documenting transfers for materials accounting purposes).

a. External Transfers.

- (1) The shipper must obtain written verification and maintain documentation that the intended receiver is authorized to accept the material before the material is transferred.
- (2) Transfers of nuclear material between facilities having a different RIS must be documented using the electronic equivalent of DOE/NRC F 741. Manual/paper DOE M 741's may be used to meet this requirement with the approval of the DOE cognizant security authority. These forms must be prepared and distributed to the principals of the transaction and line management, as required by Section B of this Manual.

- (3) Immediately after receipt, shipments must be subjected to a transfer check. Transfer checks must consist of confirming the shipping container or item count, validating the TID integrity and identification, verifying the tamper-indicating characteristics of the container, and comparing with shipping documentation to ensure the shipment was received intact. For external transfers, all SNM containers must be tamper-indicating.

For purposes of transfer checks, receipt occurs when the transfer vehicle is unloaded or the transfer vehicle's integrity is breached (TIDs removed or broken) at the receiving facility. The site/facility operator must have documented procedures that specify actions to be taken in the event discrepancies are detected. Records of transfer checks are subject to audit and must be retained at least until the next S&S survey. For accountability purposes, material in transit at the end of a reporting period must be included in the receiver's reported inventory even though physical receipt of the material has not yet occurred.

- (4) For all unirradiated Category I and II quantities of SNM transferred between facilities having a different RIS, the receiver must perform a verification or accountability measurement unless both RISs are located on the same site and are operated by the same site contractor. Both verification measurements and accountability measurements are quantitative measurements used by the receiver to verify that the amount of SNM in a shipment is as stated by the shipper. Accountability measurements differ from verification measurements only in how they are used in receiver's accountability system. Accountability measurements are entered in receiver's accountability system as the value for the shipment. When verification measurements are used, the shipper's values are entered into the receiver's accountability records.

- (a) The receiver may choose to establish a new accountability value or accept and book the shipper's accountability value considering the potential impact on the inventory difference. Transfer of nuclear material produced to program specification and intrinsically tamper-indicating may be verified by performing a confirmatory measurement rather than a verification/accountability measurement unless the DOE cognizant security authority requires verification/accountability measurements.

Use of confirmatory measurements in lieu of verification/accountability measurements for such items requires a shipper/receiver agreement approved by both the shipper's and receiver's DOE cognizant security authority. For Category III and IV transfers, the DOE cognizant security authority may require that measurements be made consistent with the strategic, nonproliferation, and/or monetary value of the material, or as

required for environmental, safety, and operational controls. Verification/accountability measurements must be completed prior to processing material, unless a deviation is approved or the criteria defined in paragraph 5a(4)(f) are met. When verification/accountability measurements are required and materials are to be processed before the verification/accountability measurements have been made, the shipper and receiver must reach an agreement as to how significant shipper/receiver differences will be handled.

- (b) The shipper must independently determine the measured values before shipment unless the integrity of the item and of the existing measured values have been ensured. The shipper's measured values must be documented on DOE/NRC F 741.
- (c) The receiver's confirmation and verification/accountability measurements (when required) for Category I and II quantities of SNM transfers must be accomplished in accordance with the requirements in Table II-4, Shipper/Receiver Measurement Requirements. The receiver's verification/ accountability measurements for transfers involving other categories of nuclear material, when required by the DOE cognizant security authority [see paragraph 5a(4)(a)], must be performed in accordance with the requirements in Table II-4, Shipper/Receiver Measurement Requirements.

**Table II-4. Shipper/Receiver Measurement Requirements**

Material Categor	Material <sup>1</sup> Confirmation	Verification/Accountability <sup>2</sup> Measurements
IA	3 working days	Shipper's value
IB	5 working days	30 calendar days
IC, II	10 working days	30 calendar days
III	10 working days	120 calendar days or on input to process
IV	20 working days	On statistical bases within 180 days or on input to process

<sup>1</sup>Confirmatory measurement by nondestructive analysis, gross weight check, and item count (if not done as part of transfer checks). Confirmatory measurements are not required for all materials. When confirmatory measurements are required, they must be performed within the time frames of this table.

<sup>2</sup>Quantitative determination of material quantities (within designated measurement uncertainty limits).

Accountability measurement values are entered into receiver's accountability records. For verification measurements, the shipper's values are entered into the receiver's accountability records.

Verification/accountability measurements are not required for all materials. When verification/accountability measurements are required, they must be performed within the time frames of this table.

- (d) For shipment of unirradiated SNM containing greater than 250 grams of a single SNM type and for each discrete item exceeding

250 grams, limits of error at the 95 percent confidence level must be assigned to shipper and receiver accountability/verification measurements for both the element and isotope values. Limits of error need not be reflected on the DOE/NRC F 741 for external transfers when accountability measurements cannot be performed. For other shipments, the shipper and receiver may estimate the limits of error. Limits of error are also required for all measurements of external transfers of tritium that exceed 2 grams, except as noted above.

- (e) Documented acceptance/rejection criteria must be established and used to evaluate confirmatory measurement data. A response plan for investigation and resolution of confirmatory measurements that fail acceptance criteria must be developed and implemented, and all anomalies must be investigated and resolved.
- (f) If delays in completing the receiver's verification/accountability measurement will result in a protracted delay in closure of the transaction, a confirmatory measurement may be used to affect a "safeguards closure" of the transaction. The transaction is documented by an "A-S" entry on DOE/NRC F 741. A safeguards closure may be used when the integrity of the shipment is ensured and only verification/accountability measurement differences are possible between shipper and receiver. If the receiver's verification/accountability measurement performed after a safeguards closure indicates a shipper/receiver difference, the difference may be resolved by mutual agreement of the shipper and receiver with the approval of their DOE cognizant security authorities and an adjustment (correcting entry) to the DOE/NRC F 741, if required.

The safeguards closure may be affected only when all of the following conditions have been met.

- 1 No discrepancies are found in the verification of the piece count, identification number, integrity of the TIDs, and gross weight of the items or containers received, and no evidence indicating theft or diversion of the material is found.
- 2 The shipper and receiver confirmation measurements must confirm the same nuclear material attribute, must compare results of the methods on a technically valid basis, and the results must be within the established limits of agreement.

3 Criteria for closing transactions, based on confirmatory measurements, are approved by both shipper's and receiver's DOE cognizant security authority, and the shipper/receiver agreement is in effect for the transaction.

(g) Limited processing is acceptable for materials not amenable to nondestructive assay in order to perform a receipt measurement, as approved by both shipper's and receiver's DOE cognizant security authority. Limited processing can include homogenization and dissolution.

(5) SNM in foreign reactor fuel returns must either be measured; or the risk of diversion of material from the fuel must be documented, and the acceptance of the fuel without measurement must be approved by the responsible Under Secretary or his/her designee.

b. Internal Transfers.

- (1) The site/facility operator must provide a graded system of measurements and records to reflect the flow of material between MBAs within that facility and between it and other facilities on the same site.
- (2) The facility control system must be designed to monitor transfer activities and to deter and detect unauthorized removal of material during transfers. It must flag abnormal situations (e.g., inappropriate transfers of quantities, materials, or unauthorized personnel receiving or shipping materials).
- (3) Transfers must be documented on nuclear material transfer forms or electronic equivalents that contain required information, prepared and distributed within established time frames, and signed by authorized custodians or their alternates.
- (4) Materials must be subjected to a transfer check within 1 work day after receipt. These checks must include verification of shipping container or item count, TID integrity (if applied), and identification number. These transfer checks must be compared with appropriate documentation. Irradiated SNM requires only a transfer check.
- (5) When the isotope content of SNM transferred between MBAs is 50 grams (fissile) or more, the material must have a measured value before transfer. Measured values are not required for enriched uranium that is below 20 percent U-235 and below 10 percent U-233. Confirmation/verification measurement requirements for internal transfers must be approved by the DOE cognizant security authority, including when measurements are not required.

- (6) Acceptance/rejection criteria must be established and documented to evaluate measurement data for internal material transfers. In addition, procedures must specify notification and response requirements if nuclear material removal or another abnormal situation is detected. (See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information about reporting security incidents.)
- 6. MATERIAL CONTROL INDICATORS. The site/facility operator must develop and implement a program that is capable of detecting losses through evaluation and assessment of shipper/receiver differences, inventory differences, and other inventory adjustments. The program must assess the material control indicators described below and ensure detection of losses and unauthorized removal of nuclear materials. Documented plans must specify responsibilities and procedures for evaluating material control indicators.
  - a. Shipper/Receiver Difference Assessment. Written procedures must be developed for evaluating shipper/receiver differences and for investigating and reporting significant shipper/receiver differences.
    - (1) A shipper/receiver difference is defined to be significant when it meets any of the following criteria.
      - (a) It involves a discrepancy in the number of items, regardless of the quantity of nuclear material, or confirmation measurements for the shipment fail to meet acceptance criteria covered in a shipper/receiver agreement.
      - (b) It is statistically significant. The determination of whether shipper/receiver difference is statistically significant is only required for those shipments for which verification/accountability measurements are made by both the shipper and receiver. A shipper/receiver difference is defined to be statistically significant when the magnitude of the difference exceeds either of the following:
        - 1 the limit obtained by a statistical combination of the valid limits of error for the shipper and receiver's measured values;
        - OR*
        - 2 the square root of two times a single valid limit of error when either the shipper or receiver's limit of error is invalid. When both the shipper's and receiver's limits of error are determined to be invalid, the limits of error must

be recalculated, and the statistical significance of the shipper/receiver difference must be reevaluated.

- (2) Shipper/receiver difference data must be subjected to trend analysis to detect measurement bias or material loss. Analyses must be designed to detect statistically significant cumulative shipper/receiver differences and to trigger investigations when these differences are detected.
- (3) The receiver must notify its DOE cognizant security authority and the shipper of any shipper/receiver difference determined to be significant. Both shipper and receiver must investigate their measurements and limits of error. Such investigations must be completed and documented.
- (4) Shipper/receiver differences involving a discrepancy in number of items must be reported.
- (5) When shipper/receiver differences are determined to be statistically significant, but the quantities and strategic or monetary values are insufficient to warrant an investigation and subsequent correction to transfer documents, and when the receiver is DOE or one of its contractors or subcontractors, the difference need not be investigated and the party must record its own quantitative value. In the context of this paragraph, differences of less than 50 grams of fissile material or less than 5 grams of tritium are considered to be insufficient to require an investigation unless there are special circumstances. Authority to invoke the stipulations of this paragraph rests mutually with the shipper's and receiver's DOE cognizant security authority.
- (6) Statistically significant shipper/receiver differences may be resolved through any of the following methods.
  - (a) If both the shipper's and receiver's DOE cognizant security authorities obtain assurance that the measurements and limits of error are valid, and the investigation indicates that theft or diversion has not occurred, the shipper and receiver must record their own quantitative values.

*OR*

- (b) If either the shipper or receiver and their DOE cognizant security authority agree to accept the other's value, the shipper or receiver must prepare a corrected copy of the shipping document using the other's data.

*OR*

- (c) If the investigation does not result in a satisfactory resolution, the shipper/receiver difference must be resolved by the Departmental Elements concerned through traditional DOE line management channels.
- (7) The receiving facility must not process SNM contained in a shipment involving an unresolved significant shipper/receiver difference unless a shipper/receiver agreement allowing this has been approved by both the shipper's and receiver's DOE cognizant security authority.

b. Inventory Difference Evaluation.

- (1) A program for evaluating all SNM inventory differences, including those involving missing items must be developed, documented and implemented for each facility. Programs for evaluation of inventory differences for other nuclear materials may be established at the option of DOE line management. The site/facility operator must develop and implement procedures for establishing control limits and requiring an investigation when those limits are exceeded. All inventory differences that exceed control limits must be reported. Assessments of inventory differences must include statistical tests (e.g., tests of trends and biases) and must be applied, as appropriate, to both total inventory difference and actual inventory difference on both an individual and a cumulative basis for each processing MBA. Inventory records, process logs (where available), or other information may also be used to detect anomalies and trigger investigations.
- (2) Procedures for establishing control limits for inventory differences of SNM must be based on variance propagation using current data. The data should reflect operating conditions for the material balance period of the inventory. Other methodologies may be used but they must be approved by the DOE cognizant security authority and must be justified based on factors such as limited data, low transfer rates, and/or material category. For Category IV MBAs, control limits may be based on professional judgment with the approval of the DOE cognizant security authority. Significant differences between historical limits and limits based on variance propagation must be investigated for the purpose of validating, revising, and refining the variance propagation model.
- (3) Documented procedures must be established and implemented for responding to and reporting missing items and inventory differences in excess of control limits. (See DOE M 470.4-1 for additional information on reporting missing items and inventory differences exceeding control limits.)



c. Evaluation of Other Inventory Adjustments.

- (1) The site/facility operator must establish a documented program for evaluating all inventory adjustments entered in the accounting records. The program must have written procedures, including equations for applying radioactive decay and fission transmutation adjustments. A program for holdup adjustments must be justified on the basis of measurements or other factors. The program must include documented procedures for the statistical review of inventory adjustments using techniques such as tests of trends, biases, and correlation.
- (2) Procedures must be developed and implemented to ensure that all inventory adjustments are supported by measured values or other technically justifiable bases. The program must include procedures for measuring and monitoring environmental waste such as stack effluent and liquid waste streams as required by environmental protection program directives and regulations.
- (3) Procedures must be established and implemented for reporting reviews of inventory adjustments, including abnormal situations, to the DOE cognizant security authority.

### CHAPTER III - MATERIALS CONTROL

1. GENERAL. This Chapter describes the requirements for nuclear material control, consisting of four functional areas: access controls, material surveillance, material containment, and detection/assessment. The graded nuclear materials control program must be documented in the MC&A plan.
2. ACCESS CONTROLS. A graded program must be established to control personnel access to: nuclear materials; nuclear materials accountability, inventory, and measurement data; data-generating equipment; and other items/equipment the misuse of which could compromise the safeguards system.
  - a. Materials Access. A documented program must be established and implemented for each facility to ensure that only properly authorized personnel have access to nuclear materials. This program must address procedures and mechanisms to detect and respond to access by unauthorized personnel. To minimize the potential for unauthorized access to nuclear material, the amount of material in use must be limited to that necessary for operational requirements, and excess material must be stored in repositories or kept in enclosures designed to ensure that access will be limited to authorized individuals.
  - b. Data Access. Procedures must be established that ensure only authorized persons have the ability to enter, change, or access MC&A data and information.
  - c. Equipment Access. Access must be controlled to data-generating and other equipment used in material control activities. Such equipment includes measurement equipment, data-recording devices, and TIDs.
  - d. Other Considerations. Access control programs must protect against unauthorized data and equipment modification and detect unauthorized activities during emergency or other unusual conditions.
3. MATERIAL SURVEILLANCE. A nuclear materials surveillance program approved by the DOE cognizant security authority must be established and implemented for each facility. The program must ensure that nuclear materials are in their authorized locations, be capable of detecting unauthorized activities or anomalous conditions, and be capable of reporting material status. The surveillance program must address both normal and emergency conditions and include periodic testing.
  - a. Material Surveillance Mechanisms. Material surveillance methodologies must include: automated systems (e.g., monitoring devices, sensors, or other instrumentation); or visual surveillance/direct observation (e.g., the two-person rule, monitoring by external personnel); or other alternative safeguards measures that provide the necessary detection. When the direct observation method is used, the observer must have the means to recognize, correctly assess, and report

activities that are unauthorized or inconsistent with established safeguards and security requirements.

- b. Material Surveillance Programs. Surveillance procedures must describe the methodologies and operational/control points on which the program is based and provide for investigation, notification, and reporting of anomalies.

- (1) Category I and II. Material surveillance programs for Category I and II quantities of SNM must ensure that materials are in authorized locations and that unauthorized material flows and transfers are detected. Category I locations must be evaluated to determine the ability of the material surveillance system to assess material losses from MAA and PA boundaries. Category II locations must be evaluated to determine the ability of the material surveillance system to assess material losses from the PA boundary.

- (a) Material surveillance programs for all areas containing Category I or II quantities of SNM must include the following measures.

- 1 Only authorized and knowledgeable personnel who are capable of detecting incorrect or unauthorized actions can be assigned responsibility for surveillance of SNM.
- 2 Controls must be sufficient to ensure that a lone individual cannot gain access to a secure storage area.
- 3 All persons in secure storage areas must be under constant surveillance (e.g., the two-person rule or equivalent surveillance) at any time the storage area is not locked and protected by an active alarm system.
- 4 Surveillance must ensure that unauthorized or unaccompanied authorized personnel cannot enter the storage/processing area undetected when the door is unlocked or open.
- 5 When items are outside an alarmed storage area within an MAA or PA, there must be a system of hardware, procedures, and administrative controls sufficient to ensure that unauthorized accumulation of a Category I quantity is detected. When the two-person rule is utilized as an administrative control, the two authorized persons assigned responsibility for maintaining direct control of the items must be physically located where they have an unobstructed view of each other and the items, and can positively detect unauthorized or incorrect procedures.

- 6 SNM in use or process must be under material surveillance, under alarm protection, or, with the approval of the DOE cognizant security authority, protected by alternative means that can be demonstrated to provide equivalent protection.
    - 7 Material surveillance programs must ensure that attempts to remove SNM from tamper-indicating items without proper authorization will be detected. The effectiveness of the material surveillance program in meeting this requirement must be analyzed and documented.
  - (2) Category III. The material surveillance program for Category III quantities must ensure that when materials are not in locked storage, they are attended, are in authorized locations, and are not accessed by unauthorized persons.
  - (3) Category IV. Graded site/facility material surveillance programs must be developed and implemented for Category IV quantities based on the consequence of their loss. The programs must ensure that the materials are in authorized locations and are not accessed by unauthorized persons.
- 4. MATERIAL CONTAINMENT. A documented program must be in place to provide controls for nuclear materials operations relative to MAAs, PAs, MBAs, other authorized storage repositories, and processing areas.
  - a. Material Access Area and Protected Area. Controls must be in place to ensure that Category I quantities of SNM are used, processed, or stored only within a MAA contained in a PA and that Category II quantities of SNM are used, processed, or stored only within a PA. The containment program must do the following:
    - (1) identify authorized activities and locations for nuclear materials;
    - (2) identify mechanisms used to detect unauthorized activities;
    - (3) identify material types, forms, and amounts authorized to be removed from the MAA or PA;
    - (4) identify containment controls for normal and emergency conditions;
    - (5) require a periodic audit of the containment program to ensure compliance and system effectiveness; and
    - (6) evaluate roll-up.

- b. Material Balance Area. Controls must be established and implemented for each facility to ensure that nuclear materials are used, processed, or stored within an MBA and are controlled in accordance with the graded safeguards concept. These controls must ensure that materials are removed only through authorized pathways or portals and are subject to transfer and verification procedures identified in Section A, Chapter II, paragraph 5 of this Manual. Controls for MBAs must meet the following:
  - (1) be formally documented;
  - (2) identify geographical boundaries and functions of the MBA;
  - (3) identify material types, forms, and quantities permitted in each MBA;
  - (4) describe administrative controls for each MBA;
  - (5) define custodial responsibilities for nuclear materials contained within an MBA;
  - (6) identify personnel authorized to receive or ship nuclear material;
  - (7) identify material flow into and out of the MBA;
  - (8) ensure material transfer procedures are followed; and
  - (9) ensure that material quantities transferred across MBA boundaries are based on measured values consistent with Chapter II, paragraph 5b(5).
- c. Storage Repositories. (See DOE M 470.4-2)
- d. Processing Areas. Controls must be established for nuclear materials being used or stored in processing areas. The controls for in-process areas must do the following:
  - (1) describe activities and locations for storing material;
  - (2) identify components used to detect unauthorized activities or conditions;
  - (3) include procedures for moving material into or out of the processing area;
  - (4) describe control procedures for normal and emergency conditions and for maintenance activities;
  - (5) describe response actions to be taken in abnormal situations; and
  - (6) provide for audit of the processing controls on a periodic basis to ensure system effectiveness.

5. DETECTION/ASSESSMENT. Systems must be in place to detect and assess the unauthorized removal of nuclear materials, consistent with the graded safeguards concept. The system must be interfaced with the facility's physical protection and other organizational systems, as appropriate, and must be able to detect and localize removal of SNM from its authorized location, and notify the protective force and other organizations to respond when such events are detected.
- a. Tamper Indicating Devices. A documented program, administered by the MC&A organization, must be in place to control TIDs and ensure that TIDs are used to detect violations of container integrity. TID programs cannot be regarded as effective unless used in conjunction with a material surveillance program. Testing of TID integrity, location, application, and the TID record system must be conducted. The TID control program must include the following elements:
- (1) ID acquisition/procurement/destruction;
  - (2) types of TIDs used;
  - (3) unique TID identification;
  - (4) storage;
  - (5) issuance;
  - (6) personnel authorized to apply, remove, and dispose of TIDs;
  - (7) containers on which TIDs are to be applied;
  - (8) procedures for application TIDs;
  - (9) frequency and method of TIDs verification;
  - (10) procedures for responding to and reporting of TIDs violations;
  - (11) assurance that TIDs cannot be reused after violation;
  - (12) frequency and method of internal program audits;
  - (13) a DOE cognizant security authority approved listing of all containers considered to be intrinsically tamper-indicating.
- b. Portal Monitoring. The detection level of the SNM portal monitors must be based on the types and forms of SNM used, stored, or processed in the area and the credible number of removals associated with theft of a Category I quantity of SNM. Controls must be established to prevent unauthorized access to portal monitor instrumentation and cabling. A written response plan must be prepared and implemented to provide evaluation and resolution of all alarm conditions.

(See DOE M 470.4-1, *Safeguards and Security Program Planning and Management*, for additional information on reporting security incidents.)

- c. Controls. Controls must be established to ensure detection equipment remains operational during emergency conditions. Detectors and calibration standards must be maintained and controlled to ensure that portal monitors are capable of meeting detection requirements. Periodic performance testing of portal monitors must be conducted in accordance with this Manual.
- d. Waste Monitors.
  - (1) All liquid, solid, and gaseous waste streams leaving an MAA must be monitored to detect the theft or diversion of SNM. Facility waste-monitoring equipment must be maintained and controlled to ensure that the equipment is capable of detecting specified amounts of SNM as determined by the DOE cognizant security authority. Instrumentation used to monitor waste and equipment removed from an MAA must be able to detect, in combination with other detection elements, the removal of a Category I quantity of SNM through a credible theft or diversion scenario.
  - (2) A response plan for evaluating and resolving situations involving any discharge exceeding facility-specific limits must be established by the site/facility operator for the facility, and approved by the DOE cognizant security authority.
- e. Daily Administrative Checks. Daily administrative checks must be implemented for each Category I MBA (or multiple MBAs where roll-up to a Category I quantity of SNM is credible). The DOE cognizant security authority must determine and approve the scope and extent of the checks and specify the detection objectives on the basis of recognized vulnerabilities.
- f. Other Detection/Assessment Mechanisms. MC&A systems must be established for monitoring and control to provide the capability of detecting and assessing unauthorized SNM removals. Systems can include weight sensors, SNM/physical presence detectors, fiber optic seals, surveillance cameras, vault monitors, emergency egress radiation monitors, real-time inventory locator systems, etc. The MC&A system must provide sufficient information to correctly assess the alarms, localize the removal, and estimate the quantity and form of the diverted or stolen material.

**SECTION B - BASIC REQUIREMENTS FOR NUCLEAR MATERIALS  
MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA  
SUBMISSION**

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1. DOCUMENTATION AND REPORTING.

- a. All RIS-level nuclear materials transactions, material balances, and inventories must be documented in accordance with the instructions provided in Section B of this Manual and reported to the Nuclear Materials Management and Safeguards System (NMMSS), the national database for nuclear materials.
- b. The NMMSS will be used to accumulate and distribute information concerning nuclear materials transactions, material balances, and inventories.
- c. Submissions must be made in a timely manner to achieve reporting of accurate and complete data as soon as possible after the events described by the data occur.
- d. The national database will provide nuclear materials information relating to safeguards, materials management and production, inventory quantities and valuations, and other information requested or required by DOE and NRC.
- e. The national database will serve as the centralized reporting facility to provide the information required under the provisions of the United States/International Atomic Energy Agency (IAEA) Safeguards Agreement.
- f. All NMMSS data submissions that are mailed will be sent to the NMMSS operator at—

NAC International  
NMMSS Project  
P.O. Box 922088  
Norcross, GA 30010  
Attn: Document Control

- g. The correct manuals to use when reporting nuclear material to NMMSS are as follows.
  - (1) This Manual will be used to report all United States (U.S.) Government owned (owner code G) nuclear materials (See Tables XV-1 and XV-3), and non-Government owned (owner code J) nuclear materials located on a DOE site.
  - (2) NRC NUREG-0006 and NRC NUREG-0007 are used to report non-Government owned (owner code J) nuclear materials located at a licensee facility.
  - (3) Facilities, projects, and programs under the cognizance of the Office of



Civilian Radioactive Waste Management subject to NRC regulation must use the rules, standards, and criteria specified by the NRC or the NRC Agreement State in lieu of this Manual.

2. FORMS.

- a. Data collection forms identified and described in this Manual (see Chapter XVII) (or the electronic equivalent) will be used to document and report nuclear materials transactions, material balances, and inventories in accordance with the instructions provided in this Manual.
- b. A computer-generated form must contain all information necessary for proper documentation and reporting of nuclear materials transactions, material balances and inventories. Examples of the paper forms are provided in Chapter XVII for informational purposes and are not to be used to supply data to the NMMSS. The required forms that must be used are available from the NMMSS operator and online at the DOE Directives website ([www.directives.doe.gov](http://www.directives.doe.gov)).

3. REPORTING IDENTIFICATION SYMBOL (RIS).

- a. Data entered into the NMMSS is keyed to sets of RISs. The establishment, maintenance, and deactivation of an individual RIS will be based on criteria detailed in Chapter I of this Manual.
- b. Unless a shipment is covered by one of the exclusions noted in this Manual (e.g., shipments to DoD), in other DOE Orders or Manuals, or other agreements, reportable quantities of accountable nuclear material will be shipped only to facilities with a valid RIS.
- c. Following annual review of RIS information, cognizant DOE line management will provide to the NMMSS operator a locally generated memorandum verifying the information listed for the RISs under their purview, or noting any changes. The memorandum may be submitted via facsimile, e-mail, or online, as appropriate.
- d. A yearly updated copy of the RIS directory is available from the NMMSS operator.

4. CORRECTION DATA. Corrections of data previously submitted and found to be in error must be submitted to NMMSS within 1 working day following notification of the error.

5. PERIODIC RECONCILIATION OF FACILITY DATA WITH NMMSS. Reconciliation of inventory data is required of facilities following September submissions. The process to be followed is set forth in Chapter XIII, Inventory Reporting.

6. CONFIDENTIALITY OF DATA.

- a. Information requested must be classified as required by DOE classification guidance. Classified information is exempt from public disclosure under the Freedom of Information Act (FOIA). (See 5 U.S.C. 552.)
- b. Unclassified information collected in NMMSS is subject to public disclosure. Exemption from disclosure can be requested. (See exemption categories in DOE 471.3-1, *Guide to Identifying Official Use Only Information*, dated 4-9-03.) A respondent may specifically request that data be withheld under the applicable FOIA exemption; however, the final determination with regard to disclosure or nondisclosure of information will be made by DOE.
- c. DOE regulations for handling proprietary information of a private business, foreign government, or an international organization [10 CFR 1004.11(b)] allow a respondent to advise DOE that data submitted on the forms should not be made available to the public. A new written justification need not be submitted each time data is submitted if the respondent's views with regard to the confidentiality of the information requested have not changed.

7. CLASSIFICATION OF DATA. Data submitted to NMMSS must be classified, marked, transmitted, and handled commensurate with DOE M 470.4-4, *Information Security*, DOE M 475.1-1A, *Identifying Classified Information*, and applicable DOE classification guidance.

8. CONTACT. Comments and inquiries may be directed to the Office of Resource Management, or the NMMSS operator ([www.nmmss.com](http://www.nmmss.com)) at the following address.

NAC International  
NMMSS Project  
P.O. Box 922088  
Norcross, GA 30010  
Attn: Document Control

9. NMMSS PROGRAM MANAGEMENT AND QUALITY CONTROL. Two sources for information regarding quality assurance of the NMMSS database and program are the DOE Chief Information Office (CIO) and the DOE Management Control Program. (See DOE O 413.1A, *Management Control Program*, dated 4-18-02.) In the CIO's Office, the DOE Information Architecture program helps ensure compliance with OMB Circular A-130, *Management of Federal Information Resources* (2003) and the Clinger-Cohen Act of 1996 by promoting standard architectural practices, providing a framework for corporate systems modernization, and establishing an information architecture vision aligned with the Department's strategic goals.

10. SPECIFICATIONS FOR SOFTWARE AND HARDWARE SYSTEMS. Software and hardware systems used to implement NMMSS must follow guidelines promulgated by the DOE CIO's office in accordance with OMB Circular A-130 and the Clinger-Cohen Act of 1996. One of the goals of these standards is to ensure compatibility of systems and databases and thereby decrease the costs associated with non-standard or incompatible systems.

## **CHAPTER I - INSTRUCTIONS FOR APPLYING FOR, CHANGING, OR DELETING A REPORTING IDENTIFICATION SYMBOL**

### **1. INTRODUCTION.**

- a. Each contractor and facility Reporting Identification Symbol (RIS) is associated with a specific DOE element. A RIS must consist of a minimum of three alphabetic characters, and in special circumstances, a maximum of four characters. This and other information concerning instructions for RIS lettering conventions can be obtained from the NMMSS operator.
- b. DOE line management must forward requests for new RISs or revisions of RIS information and any requests for activation, or deactivation, of a RIS accompanied with the effective date of activation, deactivation, and/or transfer, to the following address:

NAC International  
NMMSS Project  
P.O. Box 922088  
Norcross, GA 30010  
Attn: Document Control

### **2. PROCEDURES AND CRITERIA FOR ESTABLISHING A RIS.**

- a. To establish a RIS the following procedure applies.
  - (1) A request from the MC&A field representative, who may be either a DOE Federal or contractor employee, is routed to the DOE cognizant security authority for review and approval.
  - (2) A DOE Headquarters (HQ) sponsoring program office must approve activities for which the RIS is requested.
  - (3) The request is then sent from the DOE cognizant security authority, through the appropriate HQ program office, for coordination with the Office of Resource Management to establish the RIS required for DOE approved activities.
  - (4) The Office of Resource Management instructs the NMMSS operator to add the RIS.
- b. Justification must exist before a new RIS can be established. The following is a list of common reasons for requesting a new RIS. The facility must:
  - (1) anticipate Departmental authorization to contain an inventory of nuclear materials within the next 12 months;

- (2) be involved in international shipments or receipts of nuclear materials; or
    - (3) be storing or processing material under International Atomic Energy Agency safeguards.
  - c. A facility that does not meet the above criteria, but believes a RIS is necessary for operations, can request a RIS by submitting proper justification and documentation through the DOE Cognizant Security Authority to the Office of Resource Management by following the procedure outlined in paragraphs 2a(1)-(4) above.
- 3. APPLICATION FOR A RIS. To establish a new RIS, the DOE cognizant security authority must provide the following information to be listed in the NMMSS directory.
  - a. Facility/RIS information.
    - (1) Facility name.
    - (2) Date RIS issued.
    - (3) Contract number.
    - (4) Code of responsible financial organization.
    - (5) DOE field element or site office RIS.
    - (6) Contractor type.
    - (7) Operation type.
    - (8) FAX Numbers.
      - (a) Classified.
      - (b) Unclassified.
    - (9) FAX verification number.
      - (a) Classified.
      - (b) Unclassified.
    - (10) Secure Information Management and Exchange Network (SIMEX) routing indicator.
    - (11) Additional information on facility/RIS.
  - b. Contact information.

- (1) Nuclear materials representative (NMR).
    - (a) Name.
    - (b) Telephone number.
  - (2) Alternate NMR (NOTE: More than one alternate NMR is allowed).
    - (a) Name.
    - (b) Telephone number.
  - (3) Nuclear materials financial representative.
    - (a) Name.
    - (b) Telephone number.
  - (4) Authorized contact for information changes.
    - (a) Name.
    - (b) Telephone number.
  - (5) Any additional contact/inquiry information.
- c. Mailing information.
- (1) Addresses (including facility name and unclassified address).
  - (2) For a classified address, use guidance from the Safeguards and Security Information Management System (SSIMS). Contact a cognizant security authority for the current phone number. Do not enter a classified address with this data.
  - (3) Any additional financial and mailing information.
- d. Shipping address and information.
- e. Additional information not covered elsewhere.
- f. The following logistical information is required for RIS directory appendices and program controls. Enter "N/A" where requested data is not applicable.
- (1) Effective date nuclear materials will be transferred from old contractor/facility (enter old RIS) to new contractor/facility.
  - (2) Effective date the DOE office will assume responsibility for the new RIS.

- (3) Frequency of the new RIS inventory reporting.
  - (4) Level of classification for transactions, inventory, and material balance reports (MBRs) throughput for the new RIS and for related reporting products from NMMSS.
  - (5) Mode of transmitting input data from the new RIS to NMMSS.
  - (6) Cost center for new RIS's financial activity.
  - (7) Authorized contacts (may be different from NMR or alternate) and phone numbers.
- g. NMMSS operator staff will work with each facility to identify reports that must be submitted for each RIS.

4. DEACTIVATION OF A RIS.

- a. RIS deactivation will occur when a facility's authorization to store/handle nuclear materials inventory is withdrawn. Before deactivation, all open transactions must be resolved and all inventory removed to a balance of zero.
- b. The NMR of the RIS being deactivated should initiate and receive certification from the NMMSS operator that no project numbers exist for that RIS. If there are project numbers associated with the RIS that is to be deactivated, the project numbers must be cancelled or changed to reflect proper status of the material.
- c. An assessment by the MC&A field representative must conclude the following.
  - (1) All physical MC&A activities have been terminated.
  - (2) All material has been shipped from the facility.
  - (3) The balance for that RIS in NMMSS is zero (0).
  - (4) No investigations or audits are under way concerning any aspect of MC&A.
- d. Notification of deactivation is sent from the DOE cognizant security authority to the Office of Resource Management, who will instruct the NMMSS operator to deactivate the RIS.
- e. A waste facility's RIS must not be removed except with specific approval of the responsible Departmental Element through the DOE cognizant security authority and upon coordination with the Office of Resource Management.
- f. A parent RIS must not be deactivated when a sub-RIS is still active.

5. CHANGING RIS INFORMATION.

- a. The following procedure must be followed to change information entered on a facility's RIS directory page.
  - (1) Make a copy of both sides of the page from the RIS directory for each affected RIS.
  - (2) Draw a line through the outdated/erroneous information on the copy.
  - (3) Immediately above the strike-out, print the new information clearly.
  - (4) Submit the pages marked for change to the NMR, or other authorized person who will sign and date all directory pages on which changes have been recorded. Unsigned changes cannot be made.
  - (5) Send page changes to the DOE cognizant security authority for approval and forwarding to the NMMSS operator.
- b. The NMMSS operator will provide a written copy to the Office of Resource Management for information/file purposes.



## CHAPTER II - GENERAL INSTRUCTIONS

This Chapter provides general instructions for all reports sent to NMMSS and additional guidance where appropriate. Three types of information are submitted to NMMSS: transactions, material balances, and inventories. Additional guidance for specific types of reporting is provided in subsequent Chapters.

### 1. REPORTING TO NMMSS.

- a. Facilities must report data to the NMMSS electronically. If electronic means are unavailable, reporting using paper forms is permitted; however, it must be coordinated through the DOE cognizant security authority. Under emergency conditions or if a special, non-standard report is required, paper forms may be used.

NOTE: In this Manual, paper forms and numbers (e.g., DOE/NRC Form (F) 741) are mentioned for instructional purposes. The fact that a paper form is available does not relieve the facility from the requirement to report electronically.

- b. When a reportable quantity of an accountable nuclear material is recovered during deactivation, decommissioning, or decontamination, the recovered material must be reported to NMMSS, even when the material has been previously written off the NMMSS records. A DOE/NRC F 741 must be used.
  - c. Facilities are encouraged to use the NMMSS software package, Safeguards Management of Software, to edit site data prior to submitting electronic data to NMMSS. This software may be obtained from the NMMSS operator.
- ### 2. DATA ACCURACY. DOE line management is responsible for ensuring that the NMMSS accurately reflects nuclear material inventory data at license-exempt facilities, and DOE-owned nuclear material inventory data at licensed facilities.
- ### 3. NMMSS REPORTABLE ELEMENTS AND ISOTOPES, AND REPORTING UNITS.
- a. The elements and isotopes that must be reported to NMMSS are shown in Table XV-1.
  - b. Weights must be reported in the metric weight units specified for each nuclear material as shown in Table XV-1.
  - c. Both element and isotope weights are reported if they round to a reportable quantity. In cases where the element is a reportable quantity, but the isotope is not a reportable quantity, the material must still be reported, but for the isotope, enter 0 (zero). In cases where the isotope is a reportable quantity, but the element

is not a reportable quantity, the material must still be reported but for the element enter 0 (zero). (See paragraph 6 and Table II-1, below)

4. MATERIAL TYPE CODES. Table XV-2 provides the material type (MT) codes used by DOE for reporting nuclear materials. Note that other entities (e.g., IAEA) may use different codes for the same materials.
5. UNITS, STANDARDS, CONVERSIONS, AND DATA DEFINITIONS.
  - a. Metric units are required for reporting information to the NMMSS.
  - b. If weights are in pounds, the conversion factor 0.45359 kg/pound must be used.
  - c. A year is defined as 365.2422 days.
  - d. Nuclear material properties (e.g., half-lives) can be found online at [www.nndc.bnl.gov](http://www.nndc.bnl.gov). For other material properties and equations, see CRC Handbook of Chemistry and Physics.
  - e. Measurements that have been made, and records that have been kept, in volume units must be converted to the reporting unit for the material type. Material properties and equations in the CRC Handbook of Chemistry and Physics must be used to convert gas or liquid volumes to the appropriate units.
  - f. Parts per million calculations will be recorded as—
    - (1) ppmv for volume basis,
    - (2) ppm for mass basis, and
    - (3) ppma for number of atoms basis.
  - g. The calculation for ppm of U-232 in total uranium is a mass basis.
  - h. NMMSS will not accept slashes (\ and /), semi-colons (;), colons (:), question marks (?) or number sign (#). Do not use those characters when entering data.
  - i. For the definitions of data elements, e.g., field length and whether a numeric or alpha character is allowed, see NMMSS Reports D-23 (for DOE) and D-24 (for NRC), available from the NMMSS operator.
6. ROUNDING POLICY.
  - a. Quantities will be reported as shown in Table II-1, below with fractions of  $\frac{1}{2}$  or greater rounded upwards and fractions of less than  $\frac{1}{2}$  of a reporting unit reported as the number zero (0).

- b. Nuclear material transactions should be documented and reported as accurately as possible to reflect the actual quantity of material transferred. If a transaction of discrete items, each of which is less than a reportable quantity, sum to a reportable quantity, the transaction should be recorded to most accurately reflect the actual quantity involved. The shipper and receiver will decide how to ensure appropriate accounting documentation in NMMSS. Both the shipper and receiver must agree on the method to use. If the shipper and receiver cannot agree, the Office of Resource Management will decide how best to document the transaction.
- c. When performing general calculations not related to discrete items in a transaction (see paragraph 6b above), do the calculation first before rounding.
- d. For software development purposes, sites or facilities may use more significant digits than noted in this Manual.

**Table II-1. Rounding Policy.**

Quantity	Action
Equal to or greater than 0.5 of the reporting unit	Report to the nearest whole reporting unit
Less than 0.5 of the reporting unit	Report as 0 (zero)

7. NUCLEAR MATERIAL BLENDING TRANSACTIONS.

- a. Blending or crossovers of materials are reported to the NMMSS to ensure accurate records of the facility's material inventory. The report to the NMMSS would show the reduction in one or more quantities and the increase in another.
- (1) Inventory change code 22 (from other materials) is used to show the gain in material.
- (2) Code 71 (degradation to other materials) is used to show the reduction of material.
- b. The NMMSS has been programmed to recognize a blending or crossover operation by the order in which the codes 22 and 71 are presented. The lines of data on DOE/NRC F 741 must appear in sequence. That is, a line or lines with code 22 must be followed by matching line or lines with code 71. There are two methods of matching codes 22 and 71. One method is to pair code 22 with the corresponding 71, a second method is to list a series of code 22s followed by corresponding 71s (See Table II-2 below for an example).
- c. When reporting a blending transaction with multiple sets of code 22/71 combinations, the position of the 22 in the data set must correspond to the position of the 71 in the data set. For example, row number 1 must correspond to row number 6. This case represents the blending of material from summary

- d. MT 10 to summary MT 20. Row 2 must correspond with row 7 in the data set, etc. For specific format requirements, refer to the guidance for electronic format data submissions.
- e. In reporting blending operations, follow the code 22 and 71 matching rules in addition to the following.
  - (1) As an internal transaction, RIS entries must be identical.

**Table II-2. Blending Transaction Example.**

Row Number	Type Inventory Code	Summary Material Type
1	22	10
2	22	10
3	22	50
4	22	50
5	22	50
6	71	20
7	71	81
8	71	83
9	71	83
10	71	83

- (2) Use action code M.
  - (3) The two data lines, codes 22 and 71, must agree in terms of quantities, plus or minus a reportable unit.
  - (4) Plutonium blending operations must also be reported. For such blending operations, only the element weight (total plutonium) is compared. The different MTs of plutonium account for the different isotopes of plutonium. For example, the reportable isotope for MT 50 is Pu-239+241. The reportable isotope for MT 83 is Pu-238. When blending these plutonium MTs, there is no direct relationship between the individual isotope weights.
  - (5) For blending operations with different accountable nuclear materials, the relative quantity (mass) of each accountable material is to be maintained.
8. OWNER CODES. The codes in Table XV-3 are used to identify ownership of nuclear material for transactions and inventory reporting. For instructions regarding the proper owner code to be used in a particular circumstance, contact the NMMSS operator.

9. LIMITS OF ERROR ON TRANSFERS OF SPECIAL NUCLEAR MATERIAL AND TRITIUM.

- a. DOE contractors will determine and notify DOE of limits of error on transfers of SNM and/or tritium (except in the case of tritium in reservoirs), as required by Section A, Chapter II, 5.a.(4)(d).
- b. Such notification will be made on a DOE/NRC F 741.
- c. Limits of error will be recorded on all copies of the form.

10. NORMAL OPERATIONAL LOSSES (NOLs), MEASURED DISCARDS AND ACCIDENTAL LOSSES.

- a. The instructions in this Section are provided to supplement the reporting procedures for NOLs, measured discards and accidental losses. Losses and discards are reported using a DOE/NRC F 741.
- b. When reporting NOLs, measured discards or accidental losses, the following apply.
  - (1) License-exempt and/or licensed contractors not subject to the requirements of the U.S./IAEA Safeguards Agreement will use one of the following. (See Chapter IV for transaction definitions.)
    - (a) A-M transactions to remove loss or discard material from active inventory for subsequent shipment to a waste management site.
    - (b) A-A transactions remove material from active inventory when—
      - 1 it is shipped to a waste management site,
      - 2 it has been discharged to the atmosphere or the ground, or
      - 3 it has been consumed in use.
  - (2) License-exempt and/or licensed contractors subject to the requirements of the U.S./IAEA Safeguards Agreement will use A-A transactions.
  - (3) If paragraph 10b(1)(a) or 10b(1)(b) applies, one of the letters listed below may be appended to the facility's 3-character RIS, as appropriate. The 3-character identifier will be entered as the shipper's RIS in block 1 of DOE/NRC F 741 or as the receiver's RIS in block 2. The 3-character identifier must be on file with the NMMSS before it is used for reporting to the system. The following letters are for use by all reporting facilities.
    - (a) A—discharge to the atmosphere,

- (b) G—discharge to the ground or a body of water or stream,
- (c) I—discharge to run-off, and
- (d) R—consumed during use.

NOTE: It is understood that recovery of material discharged to the ground as a result of an accidental loss may not be possible.

- (4) The following letters are for use only by license-exempt contractors subject to the requirements of the U.S./IAEA Safeguards Agreement and licensed contractors.
  - (a) H—a waste holding area from which material could be recovered and
  - (b) L—a lagoon, holding pond, or tank from which material could be recovered.
  - (c) The use of codes H and L is optional for non-licensed contractors not under IAEA reporting requirements.
- (5) When reporting NOLs or measured discards, enter code 74 as the inventory change code in block 26c or 27c of DOE/NRC F 741, as appropriate.
- (6) When reporting accidental losses, enter code 75 as the inventory change code in block 26c or 27c of F 741, as appropriate.
- (7) When reporting the return to active inventory of material previously reported as a NOL, measured discard, or accidental loss, follow the instructions below. (See Table XV-19 for additional information.)
  - (a) A previously reported NOL, measured discard, or accidental loss may be reversed through the adjustment process.
  - (b) An A-B transaction with no inventory change code, (transfer from a V RIS, or waste disposition area, to a facility) may be reported to the NMMSS as a receipt on line 30 of the MBR generated for the receiving facility. [NOTE: This applies only if the waste disposition area is an onsite waste holding area (H) or a lagoon (L).]

11. WASTE AND BURIAL SITES.

- a. For site closure or decommissioning, or if the receiver requires documentation, report waste transactions as follows.

- (1) Document transactions of waste material using DOE/NRC F 741.
  - (2) For transfers of nuclear material from a waste disposition area (i.e., a 3-character RIS with a fourth character H, G, or L appended) to a waste management site (V RIS), the applicable composition/facility code will be entered in block 26h of the DOE/NRC F 741 documenting the transfer.
  - (3) Transfers to or from a waste management site (V RIS), including transfer from one waste management site to another, and transfers identified with character H appended to the RIS, will be reported to the NMMSS on a DOE/NRC F 741.
  - (4) Shippers and receivers will evaluate and make changes and adjustments to records, as necessary, based upon remeasurement.
- b. A waste disposition area on the site subject to both DOE and NRC reporting requirements will be assigned at least one 4-character RIS. The first three characters must correspond to the DOE or the NRC RIS for the facility. It is only required that one 3-character RIS be assigned for reporting data for the waste disposition area. The assignment of more than one RIS to a waste disposition area will be at the discretion of DOE line management.

12. RADIOACTIVE DECAY.

- a. Radioactive decay will be reported in accordance with Chapter XV, Tables XV-4, XV-5, and XV-6.
- b. Facilities will send data on reportable quantities of radioactive decay to the NMMSS on a DOE/NRC F 741 in accordance with instructions in Chapter III of this Manual.
- c. The shipping facility will calculate and report decay on material in transit up to the first day of the month in which the material was shipped.
- d. Using a locally generated report or memorandum, the shipper will inform the receiver of the date on which decay for the items being shipped was last calculated.
- e. The receiving facility will calculate decay for the entire month in which the shipment was received or in which the shipment was in transit at the report date; however, no decay will be reported until the end of the month in which the material is actually received.
- f. For material in transit over the period from the end of one month through the beginning of another, the receiving facility will calculate and report decay for a 2-month period, i.e., the month in which the material was shipped and the month in which it was received.

- g. Daily decay constants will be calculated using the formula below (unless half-lives are stated in days).

$$\text{Decay Constant (days}^{-1}\text{)} = \text{Ln}(2) / (T_{1/2} * 365.2422) \text{ where—}$$

$$T_{1/2} = \text{Half Life (years)}$$

- h. Decay calculations are made for days, months, and quarters. month and quarter decay factors are provided for the convenience of the user. To calculate decay, use the following formula.

$$Q_t = Q_o * e^{(-d * C)}$$

where—

$Q_t$  = quantity of material left at time t after undergoing decay

$Q_o$  = initial quantity of material before calculating decay

d = number of days

C = decay constant from table. Can be either days, months, or quarters.



### **CHAPTER III - NUCLEAR MATERIAL TRANSACTION REPORTING— GENERAL**

1. INTRODUCTION. This Chapter provides general instructions for transaction reporting. In addition to the instructions in this Chapter, specific procedures for completing each form and for submitting the data to NMMSS are contained in Chapters IV and V. The in-transit accounting rule that DOE has adopted states that when nuclear material leaves the shipper, it officially goes on the receiver's books in NMMSS.
  - a. Shipper-Receiver Differences. Consult Section A of this Manual for requirements on evaluating shipper-receiver differences.
  - b. Transactions within the U.S. (non-DoD). Instructions are provided in Chapters III, IV, and V.
  - c. Transactions of Obligated Material. See Chapters III, IV, V, and VIII of this Manual.
  - d. Transactions Involving DoD. In any instance where either a contractor of U.S. Government facility has a transaction involving a shipment to or receipt from DoD pursuant to 42 U.S.C. 2121(b), or 2121(c) (which address DOE and mutual defense activities) such facility must prepare and distribute DOE/NRC F 741 in accordance with instructions provided in Chapter VI of this Manual and any additional guidance which may be provided by DOE line management or the DOE cognizant security authority.
  - e. Transactions Involving International Accounts. See Chapter VII of this Manual for details.
    - (1) Foreign nations, foreign regional organizations, supranational organizations, or foreign facilities (hereinafter referred to collectively as foreign entities) may receive or return U.S. Government-owned material obtained by sale, lease, grant, donation, or loan from contractor facilities, or from NRC or Agreement State licensees, pursuant to 42 U.S.C. 2074 and 2094 and 42 U.S.C. 2112 or 2121(c).
    - (2) For a transaction involving an export/import, the facility must prepare both the shipper's and the receiver's data and distribute the forms.
      - (a) For exports, the shipper should request that the foreign receiver sign and return the DOE/NRC F 741 to the shipping facility to document the transfer.
      - (b) For imports, if the foreign shipper's data are incomplete or unknown, the receiver should contact the DOE cognizant security authority for further guidance.

- (3) International transfer data should be handled according to the instructions in Chapter VII of this Manual. For DOE exports, guidelines once set forth in the International Nuclear Materials Tracking System (INMTS) are included in Chapter VII.
  - (4) For international transfers that are covered by more than one export/import license, a separate DOE/NRC F 741 must be prepared for the material covered by each individual export/import license. See Chapter VII of this Manual for details.
  - (5) Tracking imported material having foreign accounting obligations requires the use of special tracking procedures. See Chapter VIII of this Manual for details.
2. TRANSFER REPORTING TIMELINES. Data on all transactions occurring during a calendar month will be submitted no later than 8 working days following the end of the month during which the transactions occurred. These extra days are justified as time needed for monthly closure of the books for reasons of monthly adjustments. Table III-1 shows deadlines for distribution of DOE/NRC F 741.

**Table III-1. Submission Dates for Physical Transfer of Material.**

Type of Physical Transfer Requiring DOE/NRC F 741 Preparation and Distribution	Reporting Timelines
Shipper distributes to NMMSS and receiver for domestic shipment	1 workday after receipt of shipment
Domestic receiver distributes to NMMSS and Shipper on domestic shipment	10 workdays after receipt of shipment
Shipper distributes to NMMSS shipment and foreign receiver's side of the form	1 workday after receiving the foreign receiver's data
Domestic distribution to NMMSS reporting material received from foreign shipper	10 workdays after receipt of shipment
Corrections to submitted data sent to NMMSS and other party	1 workday after correction

3. TRANSACTION DOCUMENTATION METHODS. Facilities must distribute transaction documentation electronically unless manual/paper submission is coordinated through the DOE cognizant security authority.
- a. Electronic Method.
    - (1) Procedures and instructions in this Manual will apply except that signatures on transaction documents are not required. Internal controls will ensure that data transmitted has been properly authorized.

- (2) The sender and recipient of electronic data will produce hard copies as needed by organizations on the distribution lists in Table III-2 and Table III-3, below.
    - (3) The hard copies will contain the information normally included on DOE/NRC F 741.
    - (4) For activities involving NRC or Agreement State licensees, the electronic method of handling and transmitting transfer data will follow all requirements of 10 CFR 74, *Material Control and Accounting of Special Nuclear Material*.
  - b. Manual Method.
    - (1) Facilities with a low volume of reporting activity may prepare DOE/NRC F 741 in paper form if coordinated with the DOE cognizant security authority.
    - (2) Such facilities are encouraged to convert to electronic form preparation in coordination with the NMMSS operator.
  - c. Either Method.
    - (1) Regardless of method used, nuclear material types, elements, and isotopes to be reported, and their respective reporting units will be as specified in Table XV-1.
    - (2) For each detail line of shipper/receiver data entries on DOE/NRC F 741, material quantities reported by assay may be summarized, but only within detailed MT assay ranges (e.g., for enriched uranium, within 10 to 20 percent U-235 or within 80 to 92 percent U-235, as appropriate) required for reporting inventory (See Chapter XIII, Inventory Reporting).
  - d. Agreement of Transaction Data. Data sent to NMMSS will agree on a line-for-line-basis with data sent between the shipper and receiver on DOE/NRC F 741, or electronic equivalent.
4. CLASSIFICATION AND SECURITY REQUIREMENTS. DOE/NRC F 741 will be classified using appropriate guidance and following the procedures contained in DOE M 475.1-1A, *Identifying Classified Information*, and will be marked with appropriate classification markings and transmitted following procedures contained in DOE M 470.4-4, *Information Security*.
5. DISTRIBUTION OF DOE/NRC F 741.
  - a. Transaction information is generally distributed electronically; however, a few small facilities continue to use the paper DOE/NRC F 741.

- b. The distribution requirements, below, are to be followed regardless of transaction format.
- (1) If an electronic format is used, do not also distribute a paper copy unless specifically requested by the recipient.
  - (2) It is recognized that some field elements or site offices do not desire copies of transaction information in any format but, instead, rely on NMMSS reports to satisfy local needs.
  - (3) As an absolute minimum requirement for distribution of transactions information, copies should be provided to the other party to the transaction and to the NMMSS operator at RIS QFA. For one-party transactions, the facility generating the transaction must also provide a copy to the NMMSS operator at QFA.
- c. Distribution is illustrated in Table III-2.

**Table III-2. Distribution.**

Type of Transaction	Other Party To Transaction	QFA	Shipper's Field Element (If Requested)	Receiver's Field Element (If Requested)
Shipment of Material	Yes	Yes	Yes	Yes
Receipt of Material	Yes	Yes	Yes	Yes
One-party Transaction	Yes	Yes	Yes	Yes

6. FACILITY TRANSFERS OF MATERIAL TO A FOREIGN ENTITY. The shipper will include with the shipment a copy of DOE/NRC F 741 containing the shipper's data. (See Chapters VII, VIII, and IX and refer to DOE line management or the DOE cognizant security authority for guidance and further instructions.)
7. FACILITY RECEIVES NUCLEAR MATERIAL FROM A FOREIGN ENTITY. See Chapters VII, VIII, and IX and refer to DOE line management or the DOE cognizant security authority for guidance and further instructions.
8. TRACKING OF FOREIGN OBLIGATED MATERIAL WITHIN THE U.S.
  - a. Each facility will submit information necessary to track materials among facilities that use foreign obligation codes.
  - b. The shipper is responsible for supplying foreign obligation information for each shipment. Refer to Chapter VIII for further information.

- c. If the resolution of a shipper-receiver difference on a detail line of data results in a reduction of the shipper's value to an amount less than the obligated amount, the obligated amount must also be reduced. The obligated amount may not be greater than the amount of like material shipped.
- 9. TRANSFERS INVOLVING THE DoD. Except for transfers of nuclear material in naval cores and associated items, transactions will be documented in accordance with the instructions provided in Chapter VI.
- 10. TRANSFERS OF NUCLEAR MATERIAL BETWEEN DOE CONTRACTORS AND LICENSEES.
  - a. Transfers to Licensees. DOE contractors who receive authorization and requests for distribution of nuclear material to a licensee, pursuant to 42 U.S.C. 2073, 2093, and 2111, will document such transfers using DOE/NRC F 741.
  - b. Transfers from Licensees. Transfer documents for nuclear material shipped to DOE for credit or service by a licensed facility will be prepared and distributed by the shipper in accordance with the requirements of the CFR. When such material is received it will be documented by the receiver using DOE/NRC F 741.
- 11. INTERNAL PROJECT TRANSFERS. It is required that transfers of material between DOE projects under the same RIS be reported to the NMMSS (i.e. a change in project numbers). Reporting is accomplished by submitting DOE F DP-749 or by electronic data submission. Instructions for internal project transfers follow the general instructions for transaction reporting with the following special guidance.
  - a. Facilities transmitting data to the NMMSS by automated means need not complete DOE F DP-749, but must follow the data format defined below.
    - (1) Negative Values. Enter a minus sign or a dash preceding the digits to show a negative number.
    - (2) Transaction Identification Information (columns 1–18 on DOE F DP-749), described below, is common to both header and detail records.
      - (a) **Shipper columns 1–4.** Enter the shipper's or originator's RIS for transactions involving project transfers, left justified.
      - (b) **Receiver columns 5–8.** For project transfers enter the receiver's RIS left justified. The shipper's and receiver's RISs must be the same.
      - (c) **Columns 9–14, Internal Transaction Number.** Enter the number that indicates a specific transfer in a transfer series. An

alphanumeric journal entry number may be used in lieu of the transfer number.

- (d) **Column 15, Correction Number.** When a shipper or receiver issues a corrected document to adjust data previously reported, an alphanumeric character is appended to the original transfer number to identify the transaction as a correction. For correction or adjustment entries, this is a required data field. For all other transactions, this field is left blank.

(3) Transaction Codes (THAN CODE).

- (a) **Column 16, Processing Code (PC).** Enter the appropriate 1-character, alphabetic code from the list below to identify the specific type of processing action required.

- 1      A—initial entry of data to report a transaction.
- 2      C—replacement of data for a transaction. An initial entry cannot be replaced after the close of a processing period.
- 3      D—deletion of a transaction. An initial entry cannot be deleted after the close of a processing period.

- (b) **Column 17.** Make no entry.

- (c) **Column 18, Action Code (ACT CODE).** Code letter P is preprinted on the form to identify in-place transfers between projects.

(4) Header Information—Data Record Number 1.

- (a) **Column 19, Data Code.** Code number 1 is preprinted on the form.
- (b) **Columns 20–21, Number of Lines.** Enter numeric digits (01-99) to indicate the total number of detail information lines pertaining to a specific transaction.
- (c) **Columns 22–23.** Make no entry.
- (d) **Columns 24-33, Sealed Source Serial Number.** Make no entry.
- (e) **Columns 34–50, Contract/Identification Number.** Use is optional.
- (f) **Columns 51-69.** Make no entry.

- (g) **Columns 70–77, Action Date.** Enter the date the activity occurs. In the event of a correction, the date to be entered here is the date of the activity and not the date of the original transaction. The numbers representing the month should be entered in the first two columns, the day of the month in the next two columns, and the year in the final four columns. For example, January 5, 2000, would be recorded as:

MO		DAY		YEAR			
0	1	3	1	2	0	0	0

- (h) **Columns 78–80.** Make no entry.
- (5) Detail Information—Data Record Number 2.
- (a) **Column 19, Data Code.** Code number 2 is preprinted on the form.
- (b) **Columns 20–21, Line Number.** Enter a sequential number (01-99) for one transaction to identify a discrete line.
- (c) **Columns 22–31, from Project Number.** Enter the project number from which the material is being transferred, left justified.
- (d) **Columns 32–35, From Composition Code.** Enter the numeric code that identifies the chemical and/or physical form of the material under the project number from which it is being transferred, left justified. A complete set of composition codes is available from the NMMSS operator.
- (e) **Columns 36–45, To Project Number.** Enter the project number to which the material is being transferred, left justified.
- (f) **Columns 46–49, To Composition Code.** Enter the numeric code that identifies the chemical and/or physical form of the material under the project number from which it is being transferred, left justified.
- (g) **Columns 50–51, Material Type.** Enter the appropriate two-digit numeric code to identify the type of nuclear material being reported. See Table XV-1.
- (h) **Column 52, Owner Code.** Code letter G is preprinted on the form.

- (i) **Columns 53–63, Element Weight.** Enter the metric weight of the contained nuclear material.
    - 1 Enter decimal units, when required, in columns 62 and/or 63 (segregated by broken lines).
    - 2 To show negative numeric data, enter a minus sign in the column preceding the first digit. In instances where negative data are shown in whole units or tenths of a unit, zeros must be entered in the remaining decimal places with a minus sign in the column preceding the first digit.
  - (j) **Columns 64–69, Weight percent Isotope.** For each line, enter the weight percent of the isotope U-235, Li-6, Pu-240, Pu-242, or Pu-238 reported to not more than four decimal places. For U-233, enter the parts per million of U-232 right justified to column 69.
  - (k) **Columns 70–80, Isotope Weight.** Enter the metric weight of accountable isotopes using instructions for rounding off data in paragraph 11a(5) above.
    - 1 Enter decimal units, when required, in columns 79 and/or 80 (segregated on DOE F DP-749 by broken lines).
    - 2 To show negative numeric data, enter a minus sign in the column preceding the first digit. In instances where negative data are shown in whole units or tenths of a unit, zero(s) must be entered in the remaining decimal places(s) with a minus sign in the column preceding the first digit.
12. NONPHYSICAL TRANSFER OF NUCLEAR MATERIAL. DOE/NRC F 741 or electronic equivalent will be used to record a change in ownership or financial responsibility.
13. OTHER TYPES OF RECEIPTS AND REMOVALS.
- a. Various other types of receipts and removals including, but not limited to, production, transfers to and from other materials, sales, decay, losses, inventory changes, and inventory differences (see Chapter XI), will be documented using DOE/NRC F 741 or electronic equivalent.
  - b. Such other types of receipt and removal data involving reportable quantities will be documented and reported consistent with the use of inventory change codes specified in Tables XV-12, XV-13, and XV-19.



14. SPECIAL REQUIREMENTS.

- a. Authority to transfer material. Each facility must maintain documentation of authorities and responsibilities for MC&A functions, including the process and authorized signatures required to transfer nuclear material.
- b. Authority to receive material. The shipper must verify that the receiver is authorized to receive the amount and type of material that is to be shipped.
- c. Notifying Receiver of Nuclear Material Shipments.
  - (1) Each shipper will be responsible for advising and obtaining authorization from the intended receiver of proposed shipments of nuclear material and for providing all pertinent advance information.
  - (2) Specific notification requirements applicable to individual facilities are contained in the RIS Directory (available from the NMMSS operator).
- d. Reporting of Nuclear Material in Transit for Domestic Shipments.
  - (1) Material in transit at the end of a reporting period will be entered into the intended receiver's inventory.
  - (2) A facility making a shipment of nuclear material and/or initiating a DOE/NRC F 741 during the last 5 calendar days of a month will, on the day of shipment, provide the intended receiver with the following information to facilitate the reporting of material balance, transaction, and inventory data.
    - (a) Transfer series (shipper's RIS, receiver's RIS, and transaction number).
    - (b) Material types. See Table XV-1.
    - (c) Total element weights and (if warranted) isotope weights, weight percent and/or parts per million (based on estimates, if necessary). See Table XV-1.
    - (d) Project number (for owner code G material).
    - (e) Obligation tracking data, blocks 17 through 21.
    - (f) Number of items.
    - (g) Composition codes.
    - (h) Owner codes.

- (i) Date of shipment.
  - (3) The information specified above will be transmitted to the receiver by telephone on the agreed day of shipment, with confirmation by facsimile, Internet, or other electronic means (e.g., SIMEX).
  - (4) This requirement may be satisfied by the timely distribution of DOE/NRC F 741 data via appropriate telecommunications systems when both the shipper and receiver possess such capabilities.
  - e. Delayed Receiver Measurements. In cases where the receiver can not determine independent measured values for a shipment within 10 calendar days of receipt of the shipment, and there is no agreement in place whereby the receiver can accept shipper's values, the receiver will confirm receipt of the material with either an action code N, U, or S. (see Table XV-10 and the footnotes to Table XV-10 for additional information).
  - f. Mixtures of U-233 and U-235. For the case where reportable quantities of U-233 and U-235 are mixed together, a transaction on a DOE/NRC F 741 must contain two lines and be reported as follows.
    - (1) Line 1 will be reported with MT 20. The element weight will be the total uranium weight. The isotope weight will be the isotopic weight of U-235.
    - (2) Line 2 will be reported with MT 70. The element weight will be the total uranium weight. The isotope weight will be the isotopic weight of U-233.
15. AMENDMENTS OR ADJUSTMENTS TO PREVIOUSLY ISSUED DOE/NRC F 741.
- a. When one party makes an adjustment to a transaction, DOE line management will ensure that contractors under their jurisdiction will document the adjustment on a DOE/NRC F 741 or electronic equivalent.
  - b. For specific instructions regarding corrections or adjustments, see Chapters IV and V.
  - c. Contractors must transmit the completed form to the other party to the transaction within 1 workday after obtaining the adjustment data.

## CHAPTER IV - NUCLEAR MATERIAL TRANSACTION REPORTING—SHIPPER

The instructions that follow provide specific guidance in the preparation of the DOE/NRC F 741 or the electronic equivalent. The file formats for reporting electronically are maintained by the NMMSS operator and can be provided upon request.

1. SHIPPER'S DATA The shipper of the material will complete the shipper's portion of DOE/NRC F 741 by completing the numbered blocks as follows:
  - a. **Block 1, Shipper's RIS.** Enters the shipper's facility RIS his/her facility, normally a 3-character field. Under some circumstances, a 4-character RIS will be entered (e.g. appending a letter to the end of a 3-character RIS to denote discharge of material to air or ground). See subsequent Chapters for special instructions for importers and exporters of nuclear materials. This block must be completed for the following types of transactions.
    - (1) Transfers between facilities.
    - (2) Transfers between RISs within a facility.
    - (3) Transfers between facilities and DoD.
    - (4) Transfers between domestic and foreign facilities.
    - (5) Loan/lease, sale or donation.
    - (6) One-party transactions (e.g., transactions with a M action code)
    - (7) Corrections to the above transactions.
  - b. **Block 2, Receiver's RIS.** Enter the receiver's RIS, normally 3-characters when the transaction is a transfer of material from the shipper to another facility. Care should be taken to ensure that the receiving facility's RIS is reported and not the RIS for the agent handling the shipment. The shipper or originator enters its facility's RIS in this block for a one-party transaction (e.g., a transaction with a M action code). This field is completed for the types of transactions listed in paragraphs 1a(1) through 1a(7) above. See Chapter VII for special instructions for importers and exporters of nuclear materials.
  - c. **Block 3, Transaction Number.** Enter a consecutive number for the same shipper-receiver combination and ensures that a number is not skipped in the series or duplicated. (NOTE: An exception to the consecutive numbering requirement is allowed when a facility has pre-assigned or reserved numbers for programmatic needs, but the shipment does not subsequently occur. This applies to both physical and nonphysical transfers of material.) For one-party transactions, it is desirable that the shipper enter the appropriate journal entry number to identify the transaction as it occurs (e.g., 000105), the first two digits

indicating the year, the next two digits indicating the month (i.e., 01 through 12), and the last two digits identifying the specific transaction in the month. (The example above is for transaction 5 for January of 2000.) Do not prefix or suffix the transfer series number. For one-party or in-place transactions between projects or uranium enrichment contracts, an alphanumeric number may be used when necessary to maintain uniqueness.

- d. **Block 4, Correction Number.** This block is used to correct or adjust a previously issued DOE/NRC F 741. In preparing the corrected copy, the shipper or receiver will enter in blocks 1, 2, and 3, the same shipper RIS, receiver RIS, and transaction number (transfer series) used in the original report, and then enter in block 4 a consecutive correction number, beginning with 1 (numeral one). The corrected copy will clearly identify the items being corrected. The party making the adjustment will notify the other party to the transaction that an adjustment is necessary and follow up by issuing a corrected DOE/NRC F 741. The correction number is a 1-character field. An alpha correction number may be used by a facility when the correction does not affect the other facility. The shipper and/or receiver must enter the date the adjustment is entered in the facility records in block 22b or 22e, as appropriate. The shipper and receiver will distribute the corrected copy in accordance with the distribution pattern for the original DOE/NRC F 741. This field must be completed when:
- (1) A shipper or receiver issues a corrected DOE/NRC F 741 to adjust data previously reported to the NMMSS;
  - (2) A correction affects another facility. A numeric character is required, action code C for the shipper and action code D for the receiver [also see blocks 26a and 27a for further guidance (back reference line number)];
    - (a) For each detail line in block 26 or 27 being corrected, two lines must appear on the corrected copy one with the data originally submitted and the other with the correct data. The line containing the original data must show the number of items, element weight, isotope weight, and limits of error as negative quantities. (For correcting lines that were originally negative, add a positive quantity.) The corrected line must show current quantities in these data fields.
    - (b) For each detail line in block 26 or 27 being deleted, the original line must be repeated, with the number of items, element weight, isotope weight, and limits of error shown as negated quantities. (For deleting lines that were originally negative, add a positive quantity.)

- (3) Either the shipper or receiver makes an adjustment. The other party to the transaction must either accept the adjustment or acknowledge that an adjustment has been made;
  - (4) It is necessary to adjust or correct any data element in a M action code (one-party) transaction reported in a previous period. Either a numeric or an alphabetic character may be used;
  - (5) Scrap material is recovered or remeasured for a more accurate total value for the amount of nuclear material in the original shipments. The DOE/NRC F 741 for the original shipments should be corrected by prorating the total amount of the correction according to the amounts of the original shipments. When this method is determined to be impracticable, e.g., for reprocessing campaigns, measurements on several shipments of material recovered simultaneously may be reported as a correction to a single document with additional details provided to the other party.
- e. **Block 5, Processing Code.** Enter the appropriate 1-character, alphabetic code to identify the specific type of processing action required.
- (1) A—initial entry of data.
  - (2) C—replacement of data. An entire data set may be replaced at any time prior to the close of the processing period in which the initial entry was made with the concurrence of the other party to the transaction.
  - (3) D—deletion of data. Data may be deleted at any time prior to the close of the processing period in which the initial entry was made.
- f. **Block 6, Action Code.** Enter a code letter from the list below which describes the shipper's purpose in issuing the DOE/NRC F 741. The action code field is a 1-character alpha field.
- (1) A—shipper's original data (requires completion of block 22a, action date of shipment).
  - (2) C—shipper's adjustment or acknowledgment of receiver's adjustment (requires completion of block 22b, action date of shipper's correction).
  - (3) M—one-party transaction, (e.g., an onsite gain or loss) reported on DOE/NRC F 741 (or electronic equivalent), and requires completion of block 22a, 20b, 22c, or 22e.
  - (4) R—a one-party transaction to remove the WR obligation on material.
  - (5) X—a shipper's side of an obligation exchange.

- g. **Block 7.** Enter the number of pages if the submission is classified as Secret.  
NOTE: The block is reserved for paper copy submissions only.
- h. **Block 8, Shipper.** No data required. This information is not captured in the NMMSS but is for documentation purposes or desired by one or more users of the transaction information.
  - (1) **Block 8a.** Enter the name and address of the shipper.
  - (2) **Block 8b.** Enter the appropriate possession license number if the shipper is a licensee. (Do not enter an export/import license number in this block.)
  - (3) **Block 8c, Attention.** Enter the name of a specific individual to be contacted concerning the shipment.
  - (4) **Block 8d, Telephone.** Enter the telephone number of the individual identified in block 8c.
- i. **Block 9, Receiver.** No data required. This information is not captured in the NMMSS, but is for documentation purposes or desired by one or more users of the transaction information.
  - (1) **Block 9a.** Enter the name and address of the receiver.
  - (2) **Block 9b, License Number.** Enter the receiver's possession license number if the receiver is a licensee. (Do not enter an export/import license number in this block.)
  - (3) **Block 9c.** Attention. Enter the name of the individual designated by the receiver to be contacted concerning receipt of the shipment.
  - (4) **Block 9d, Telephone.** The shipper enters the telephone number of the individual identified in block 9c.
- j. **Block 10, Number of Data Lines.** Enter the total number of detail information lines supplied in block 26 for the shipper's transaction data. The total number of data lines should be between 01 and 99.
- k. **Block 11, Nature of Transaction.**
  - (1) This block is to be completed for DOE-owned material under lease or loan agreements, material sold or donated by or to DOE. See Table XV-11 for TI codes.
  - (2) If applicable, enter the appropriate code from the list in Table XV-11.
  - (3) This list is not applicable to one-party transactions.

- (4) This block is not to be completed for transfers of DOE-owned contract nuclear material within or between DOE programs, transfers of material owned by other U.S. Government agencies, transfers of privately owned material, or transfers to DOE under 42 U.S.C. 2121(b) or (c), as amended.

l. **Block 12, For Account.**

- (1) The shipper completes block 12 if the material is either DOE-owned leased/loaned material or DOE-owned contract material being transferred to a licensee or foreign entity, if the shipment represents a sale or donation of privately owned material to DOE, or if the DOE field element or site office having programmatic responsibility for the material being transferred is different from both the shipper's and receiver's DOE field elements or site offices.
- (2) Enter the address of the facility or entity having lease or loan financial responsibility for the material in block 12a and the RIS in block 12b.
- (3) For shipments by DoD, under 42 U.S.C. 2121(b) with the exception of transfers of Navy cores and associated items, the initiator of the DOE/NRC F 741 enters the appropriate RIS for the DOE shipping point reported in block 12a. For transfers of Navy cores and associated items from DoD to DOE, under 42 U.S.C. 2121(b) the RIS QZD will be entered in block 12b.

m. **Block 13, To Account.**

- (1) The shipper completes this block if the material is either DOE -owned leased/loaned material or DOE-owned contract material being transferred to a licensee or foreign entity, if the shipment represents a sale or donation of privately owned material to DOE, or the DOE field element or site office having programmatic responsibility for the material being transferred is different from both the shipper's and receiver's DOE field elements or site offices.
- (2) Enter the address of the facility or entity having lease or loan financial responsibility for the material in block 13a and the RIS in block 13b.
- (3) For shipments to DoD, under 42 U.S.C. 2121(b) (with the exception of transfers of Navy cores and associated items), the initiator of DOE/NRC F 741 enters the appropriate RIS for the DoD first destination point reported. For transfers of Navy cores and associated items from DOE to DoD under 42 U.S.C. 2121(b) the RIS QZD will be entered in block 13b.

n. **Block 14, Transfer Authority—Contract, Nuclear Material Draft or Order Number.**

- (1) Enter transfer authority for DOE-owned materials as may be appropriate, e.g., DOE contract or usage agreement number, loan/lease agreement number, draft number, SNM order number, purchase order number, letter of authorization, and so forth. Block 14 data is not required for domestic shipments.
- (2) If the shipment is to a foreign country, enter the DOE foreign contract number if applicable.
- (3) The shipper will ensure that it has appropriate authorization and approval to ship the material to the receiver before its movement.
- (4) An entry is optional otherwise, and if not one of the cited cases, the block may be used for local purposes.

o. **Block 15, Export/Import Information.**

- (1) Make no entry when reporting the following.
  - (a) One-party transactions (i.e., action code M).
  - (b) Transfers that reflect change in ownership or financial responsibility (i.e., all nonphysical transfers of nuclear material other than project transfers).
  - (c) Transfers between two RISs at the same location.
- (2) **Block 15. Export or Import Transfers, License Number.** For all export/import transfers, the shipper or originator enters the following:
  - (a) Specific NRC export/import license number if shipping arrangements are handled by an agent who is required to obtain a NRC license to export/import. If more than one export/import license is applicable to a transfer, a separate DOE/NRC F 741 must be prepared for each license.
  - (b) GEN-LIC, if the transfer is authorized under a general license.
  - (c) LIC-EXEMPT, if the transfer is exempt from licensing.
  - (d) Authorizing shipper's export declaration (SED) number if applicable. The SED number will correspond with the foreign contract number in block 14.



- (e) DOE line management or the DOE cognizant security authority will assign and monitor SED numbers.
- (3) For further instructions for transfers of nuclear material between the U.S. and foreign nations, foreign regional organizations, or supranational organizations, see Chapter VII.
- p. **Block 16, Material Type and Description.** This information is not captured in the NMMSS but is for documentation purposes or is desired by one or more users of the transaction information.
- q. **Block 17, Obligations Accounting, Line Number.** Enter sequential line number. (See also Chapter VIII.)
- r. **Block 18, Obligations Accounting, Country of Obligation.** Enter the two-character country or entity designation from Table XV-15 related to the line number entered in block 17. (See also Chapter VIII.)
- s. **Block 19, Obligations Accounting, Material Type.** Enter the 2-character MT to which the obligation is attached. Refer to Table XV-16. The only MTs to be reported are 10, 20, 50, 70, 81, and 88. (See also Chapter VIII.)
- t. **Block 20, Obligations Accounting, Obligated Element Weight.** Enter the element weight of the amount obligated. (See also Chapter VIII.)
- u. **Block 21, Obligations Accounting, Obligated Isotope Weight** (for Enriched Uranium (in U-235 and or U-233) only). Enter the isotope weight of the amount obligated to the nearest gram. (See also Chapter VIII.)
- v. **Block 22, Action Date.** The action date for a transaction is entered in one of the blocks below. Enter numerical date (MMDDYYYY).
  - (1) **Block 22a, Shipment.** Enter the date of the transaction (i.e., date of physical or nonphysical transfer of material). (See Chapter VII for special instructions for importers or exporters of nuclear materials.)
  - (2) **Block 22b, Shipper's Correction.** When either shipper's or receiver's data on a previously issued DOE/NRC F 741 is adjusted, the shipper enters either the date of shipper's adjustment or acknowledgment of receiver's adjustment.
- w. **Block 23, Miscellaneous Data.** See instructions for shipper.
  - (1) **Block 23a, Miscellaneous.** This information is not captured in the NMMSS but is for documentation purposes or desired by one or more users of the transaction information.

- (2) **Block 23b, Concise Note Attached** (DOE/NRC F 740M). This information is captured in NMMSS. Facilities engaged in the import and/or export of nuclear materials (see Chapter VII) and facilities selected under the U.S./IAEA Safeguards Agreement (see Chapter IX) may prepare a Concise Note to report additional information. The shipper places a code letter X in the 1-character field to indicate that a Concise Note is attached, if applicable. See Chapter VII for special instructions for importers and exporters of nuclear materials.
- (3) **Block 23c.** This information is captured in NMMSS. U.S. importers and/or exporters of nuclear material will use this field only if the other party to the transaction is the United Kingdom. Check the appropriate box to identify the specific type of processing action required (See Chapter VII).
- x. **Block 24, Total Gross Weight.** Enter the total gross weight of the shipment in kilograms if the transfer is between physically separated facilities. For transfers of nuclear material to or from contractor waste management sites, completion of this block is optional.
- y. **Block 25, Total Volume.** The shipper must enter the total volume, in cubic meters, if the transfer is to a DOE or NRC licensed waste management site, otherwise no entry is required.
- z. **Block 26, Shipper's Data.**
  - (1) **Block 26a, Back Reference Number.**
    - (a) This field is used to reference previously reported data for change purposes.
    - (b) The field is comprised of a change digit and a back reference line number.
    - (c) This field is optional for corrections with the following:
      - 1      Action code C.
      - 2      Action codes M and I when reporting adjustments.
    - (d) If the back reference number is reported, both the back reference change digit and back reference line number must be reported. For further guidance, contact the NMMSS operator.
    - (e) The back reference change digit represents the change digit of the document being corrected for a nullifying entry and the change digit of the document now being completed for a

correcting entry. For further guidance, contact the NMMSS operator.

- (f) The back reference line number represents the line number being corrected for a nullifying entry and the line number of the corresponding nullifying line for a correcting entry. For further guidance, contact the NMMSS operator.
- (2) **Block 26b, Line Number.** Enter a sequential number (e.g., 01 through 99 for each transaction) to identify a discrete line. The total number of discrete lines must agree with the number shown in block 10. For paper submission, if more lines of data are to be reported than can be accommodated on one page, prepare an additional DOE/NRC F 741.
- (3) **Block 26c, Type of Inventory Change.**<sup>1</sup> Enter from Table XV-12 or XV-13 the two-digit code. For a full description of each change code, see the corresponding line explanations in Chapter XI, Material Balance Reporting. Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter IX. For shipments to burial sites, see Chapter II.
- (4) **Block 26d, Identification (Batch Name).** Facilities engaged in the import and/or export of nuclear materials should see Chapter VII for additional requirements; facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter IX for additional requirements.
  - (a) If this block is not used for import/export or IAEA reporting purposes, other data may be entered.
  - (b) An entry is required on import or export transactions. Importers must use the batch name used by the shipper.
  - (c) Batch name is limited to 16 characters with the right hand eight characters unique to the reporting facility for the duration of the material balance period in which reported. Uniqueness of batch name within the RIS must be maintained. However, the receiver must use the same batch name used by the shipper. If the receipt of material results in a duplicate of an existing batch name, a subsequent internal transaction must be created to change one of the duplicate batch names.

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<sup>1</sup> Also applicable to single party/onsite transactions or when one party does not have a RIS.

- (5) **Block 26e, Number of Items.** Enter the number of similar items (e.g., cylinders, packs, drums, bottles, tank vessels) to which the line of data pertains.
- (a) When reporting fuel pins, rods, or plates, report the number of separate fuel pins, rods, or plates involved.
  - (b) When reporting fuel assemblies, report the number of complete assemblies represented by the line entry.
  - (c) For transfers of bulk material in a single container, enter the number 1. No entry is required when reporting transactions involving RISs assigned to facilities on the same site (i.e., paired RISs). Leave blank if an M action code is used.
- (6) **Block 26f, Project Number.** Project numbers are structured upon the DOE budget and reporting classification codes, and identify the Headquarters and field elements or site offices having programmatic responsibility for each project. Indices of current project identifications are maintained and issued annually (NMMSS Report T-141) to organizations engaged in DOE production and research programs. Project numbers are required for all G owner code transactions with the following specifications.
- (a) If the material is loan/lease material, the project number is QGD04LLEASE
  - (b) All export/import transactions involving DOE-owned material require the project number R50000000G on the foreign entity's side of the data indicating that the material, though located outside the U.S., will remain DOE -owned.
- (7) **Block 26g, Material Type.** Enter one of the numeric codes from the list of MTs in Table XV-2 to identify the nuclear material involved in the transaction. Facilities engaged in the import and/or export of nuclear materials should see Chapter VII for special instructions.
- (8) **Block 26h, Composition/Facility Code.** Enter the code that identifies the physical and/or chemical form of the nuclear material at the time the transaction occurs. A complete set of composition codes, which consists of available nuclear material composition codes and descriptions, may be obtained from the NMMSS operator (referred to as Composition of Ending Inventory—COEI codes).
- (a) No entry is required for inventory difference or rounding bias data (e.g., inventory change code 65 or 77 entries).

- (b) Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter IX.
- (9) **Block 26i, Owner Code.** Enter one of the 1-character alphabetic codes from Table XV-3 to identify the material ownership at the time the shipment is made. If the ownership of material on inventory is changed, a transaction must be submitted to the NMMSS reporting the change. The change is reported by an A–M transaction (in-place transfer).
- (10) **Block 26j, Key Measurement Point.** Required only for facilities selected under the U.S./IAEA Safeguards Agreement; see Chapter IX, if applicable.
- (11) **Block 26k, Measurement Identification.** If selected under the U.S./IAEA Safeguards Agreement (see Chapter IX), report the following data:
  - (a) Measurement basis.
  - (b) Other measurement point.
  - (c) Measurement method.
- (12) **Block 26l, Gross Weight.** Enter the gross weight of the line entry in rounded kilograms, i.e., weight of material plus packaging and container weight. An approximate or estimated gross weight figure is acceptable.
- (13) **Block 26m, Net Weight.** Enter the net weight of the line entry in the reportable units, i.e., weight of material excluding packaging and container weight. An approximate or estimated net weight figure is acceptable.
- (14) **Block 26n, Element Weight.** For each line, enter the metric weight of the contained nuclear material as prescribed in Table XV-1. (See Chapter II, paragraph 6, for rounding policy.)
- (15) **Block 26o, Element Limit of Error.** For transactions involving SNM or tritium, measurement uncertainties are to be entered as weight quantities in accordance with the established reporting unit for the MT.
- (16) **Block 26p, Weight % Isotope.** For each line, enter the weight percent of the isotopes U-235, Li-6, Pu-240, Pu-242, and Pu-238, as applicable, to not more than four decimal places.
  - (a) For U-233, enter the parts per million of U-232 in whole numbers.

- (b) When reporting fission and transmutation, inventory difference or rounding bias for enriched uranium only; enter the approximate original weight percent of U-235 of the material with which the transaction is associated.
  - (c) When reporting transactions involving more than one assay range of one or more materials, data pertaining to each assay range of a material must be entered on a separate line.
  - (17) **Block 26q, Isotope Weight.** For each line, enter the metric weight of accountable isotopes. See Chapter II, paragraph 6, for rounding policy.
  - (18) **Block 26r, Isotope Limit of Error.** For transactions involving SNM or tritium, measurement uncertainties are to be entered as weight quantities in accordance with the established reporting unit for the MT.
  - (19) **Block 26s, Signature of Authorized Official and Date Signed.** When submitting the data as paper copy the following apply.
    - (c) The shipper's authorized representative must sign the DOE/NRC F 741 and enter the date signed.
    - (d) For facilities that use computer-linked telecommunications systems in the transfer of data, the signature requirement is waived.
    - (e) For both imports and exports, the requirement to sign the non-DOE portion of a DOE/NRC F 741 only verifies that the individual providing the information is authorized to do so. It was never, nor is it now, intended that a signature on the non-DOE portion indicate an assumed responsibility for proper shipment or receipt of materials.
    - (f) If facilities wish, they may provide a disclaimer with the signature on the non-DOE portion to indicate that they are only signing as authorized transmitters of the data to the NMSS.
- aa. **Block 27, Receiver's Data.** Shipper makes no entry.

## CHAPTER V - NUCLEAR MATERIAL TRANSACTION REPORTING—RECEIVER

1. RECEIVER'S DATA. The receiver will complete the receiver's portion of the form by making entries in the numbered blocks as follows.
  - a. For blocks 1 through 5, follow shipper's data instructions.
  - b. **Block 6, Action Code.** Enter the alphabetic code from the list in Chapter XV that describes the receiver's purpose in issuing the DOE/NRC F 741. The action code is a 1-character alpha field.
    - (1) B—identifies receiver's data accepting shipper's weights and requires completion of block 22c. This action code is not to be used if the receiver intends to make delayed measurements.
    - (2) D—identifies receiver's adjustment or acknowledgment of shipper's adjustment and requires completion of block 22e.
    - (3) E—identifies receiver's independent measurement or determination (including rounding) and requires completion of block 22d.
    - (4) J—identifies receiver's interim reporting of project receipts of DOE production or research materials that are in transit at the end of the month or that have been received but not reported. A transaction with action code J must be followed with action code B, E, or S.
    - (5) M—identifies one-party transactions, (e.g., an onsite gain or loss) reported on DOE/NRC F 741 (or electronic equivalent), and requires completion of block 22a, 22b, 22c, or 22e.
    - (6) N—identifies known delay for independent measurements of at least 10 days but for less than 30 days. A transaction with action code N must be followed by an action code of B, E, or S.
    - (7) U—identifies known delay for independent measurements of at least 30 days. A transaction with action code U must be followed by an action code of B, E, or S.
    - (8) S—identifies receiver's data accepting shipper's weights under safeguards closure arrangement and requires completion of block 22c. (Use restricted to DOE contractor sites where an approved shipper-receiver agreement is in effect.)
    - (9) T—identifies contested weights.
    - (10) Y—identifies the receiver's side of an obligation exchange.

- c. **Block 22, Action Date.** The action date for a transaction is entered in one of the blocks below. Enter numerical date (MMDDYYYY).
- (1) **Block 22c, Receipt.** Enter the date the material is received if the receiver is accepting shipper's values without making independent measurements.
    - (a) For safeguards closures, enter the date the safeguards closure was performed.
    - (b) The receiver also should use this block to report the date of receipt of material involved in nonphysical transfers, one-party transactions (i.e., transactions with M action code), project number changes and transactions in which weights are contested. See Chapter VII for special instructions for importers or exporters of nuclear materials.
  - (2) **Block 22d, Receiver's Measurement.** Enter the date that independent measurements are performed.
  - (3) **Block 22e, Receiver's Correction.** When either the shipper's or the receiver's data on a previously issued DOE/NRC F 741 is adjusted, the receiver enters the date of the receiver's adjustment or acknowledgment of shipper's adjustment.
- d. **Block 23, Miscellaneous Data.** See Chapter IV, shipper's instructions.
- e. **Block 27, Receiver's Data.**
- (1) **Block 27a, Back Reference Number.** See Chapter IV, shipper's instructions. Also, this field is optional for corrections with action codes D or M, and I when an adjustment is made.
  - (2) **Block 27b, Line Number.** See Chapter IV, shipper's instructions.
  - (3) **Block 27c, Type of Inventory Change.** See Chapter IV, shipper's instructions.
  - (4) **Block 27d, Identification (Batch Name).** See Chapter IV, shipper's instructions.
  - (5) **Block 27e, Number of Items.** See Chapter IV, shipper's instructions.
  - (6) **Block 27f, Project Number.** See Chapter IV, shipper's instructions.
  - (7) **Block 27g, Material Type.** See Chapter IV, shipper's instructions.



- (8) **Block 27h, Composition/Facility Code.** See Chapter IV, shipper's instructions.
- (9) **Block 27i, Owner Code.** See Chapter IV, shipper's instructions.
- (10) **Block 27j, Key Measurement Point.** See Chapter IV, shipper's instructions.
- (11) **Block 27k, Measurement Identification.** See Chapter IV, shipper's instructions.
- (12) **Block 27l, Gross Weight.** See Chapter IV, shipper's instructions.
- (13) **Block 27m, Net Weight.** See Chapter IV, shipper's instructions.
- (14) **Block 27n, Element Weight.** See Chapter IV, shipper's instructions.
- (15) **Block 27o, Element Limit of Error.** See Chapter IV, shipper's instructions.
- (16) **Block 27p, Weight % Isotope.** See Chapter IV, shipper's instructions.
- (17) **Block 27q, Isotope Weight.** See Chapter IV, shipper's instructions.
- (18) **Block 27r, Isotope Limit of Error.** See Chapter IV, shipper's instructions.
- (19) **Block 27s, Signature of Authorized Official and Date Signed.** See Chapter IV, shipper's instructions.

**CHAPTER VI - NUCLEAR MATERIAL TRANSACTION REPORTING—  
DOE TO DoD**

1. FROM DOE TO DoD.

a. Weapons Transfers.

- (1) SNM in weapons will not be transferred to DoD under 42 U.S.C. §2121(b) until DOE has received direction from the President.
- (2) DOE line management must not transfer nuclear material to DoD, or authorize contractor facilities to make such transfers, until it has received prior written authorization for specific transfers.
- (3) Contractors that are the transferring organization must not ship materials without having prior written authority from DOE line management having jurisdiction for this purpose.
- (4) DOE line management and the contractor must retain written authorization on file for audit purposes.
- (5) DoD is not required to have a license to possess nuclear material for the purposes identified above.

b. Non-weapon Transfers.

- (1) In addition to the conditions identified in paragraph 1a, above, a non-weapon transfer of SNM to DoD under 42 U.S.C. §2121(b) requires the completion of DOE/NRC F 741.
- (2) With the exception of SNM transfers to the Naval Reactors program, authorization for non-weapon transfers of SNM to DoD under 42 U.S.C. §2121(b) will be obtained either from the program office responsible for the DOE-DoD activity, or from the Defense Programs Administrator when there is no DOE programmatic interface with DoD.
- (3) Authorization for SNM transfers to the Naval Reactors program will be obtained from the Deputy Assistant Secretary for Naval Reactors, NNSA.

c. Transfer of Material in the Possession of Licensees to DoD. NRC is expected to advise all 42 U.S.C. §2131 license holders that whenever licensees are required to deliver SNM to DoD, the licensee will determine from DoD whether the material is being requested by DoD under the conditions of either 42 U.S.C. §2131 or 42 U.S.C. §2121(b), as amended.

- (1) Transfers of Material to DoD as Licensees Under 42 U.S.C. §2131. When delivery is to be made, the licensee will follow the normal procedures that NRC has in effect for transfers between licensees.
- (2) Transfer of SNM to DoD Pursuant to 42 U.S.C. §2121(b).
  - (a) When delivery is to be made, the licensee will advise the DoD installation to contact the DOE Headquarters, Office of Resource Management for obtaining a determination of which DOE line management is to maintain liaison with DoD and the licensee concerning the disposition of the material.
  - (b) The responsible Departmental Element, in coordination with and through the appropriate Headquarters elements, will issue a letter to the DoD installation, with copies to the licensee and all appropriate DOE personnel, approving the transfer to DoD and designating the appropriate DOE line management as liaison with DoD and the licensee office in handling the transfer to DoD.
  - (c) When the licensee is ready to deliver the product ordered by the DoD or DoD contractor, the DOE or site office designated as liaison for the licensee will advise the licensee to initiate a DOE/NRC F 741 in accordance with the preparation and distribution instructions that apply to licensees, showing a DOE RIS as the receiving RIS for the nuclear material in block 2. The receiving RIS for such transfers must be a DOE organization and not a contractor organization.
  - (d) Further, if the receiving RIS is other than the NNSA Service Center (RIS AAA), a copy of the shipping document will be sent to AAA and so reflected in the "Distribution of Copies" block. Line management designated as the liaison with DoD and the licensee must ensure the following.
    - 1 Nature of transaction (TI) code D is entered in block 11 to indicate material is being returned to DOE.
    - 2 The licensee is shown as the shipper in block 8, and as the entity having financial responsibility for the material in block 12.
    - 3 The receiving RIS assigned by the designated DOE line management is shown as the receiver in block 9, with a parenthetical entry giving the name and address of the DoD organizational unit or contractor to whom physical delivery is made.

- 4 DOE and the designated DOE line management are shown as assuming financial responsibility for the material in block 13.
- 5 The letter from the responsible Departmental Element is referenced in block 23.
- (e) From the data on the DOE/NRC F 741 prepared by the licensee, the NMR for the designated receiving RIS will prepare a DOE/NRC F 741 from DOE to DoD using one of the following RISs for the receiving DoD installation.
  - 1 QZA for Air Force,
  - 2 QZB for Army, or
  - 3 QZD for Navy.
- (f) After DoD has received the material, the NMR of the designated receiving RIS will sign as receiver in block 27s of the licensee's DOE/NRC F 741 using the data furnished by DoD.
- (g) The following statement will be entered in block 14 by the NMR of the receiving RIS.

*Acceptance of the material in its existing form is in the best interest of the U.S. Government.*

- (h) The NNSA Service Center will be provided a copy of the completed DOE/NRC F 741. The nuclear material transferred to DoD pursuant to 42 U.S.C. 2121(b) will not contain any foreign obligated material.

d. Other Nuclear Material Transfers.

- (1) When nuclear material, other than SNM, is associated with weapons being transferred to DoD, the procedures described in paragraph 1a above, will be followed.
- (2) When nuclear material other than SNM is not associated with weapons and is being transferred to DoD, the procedures and authorization necessary for making such transfers to licensees will apply. Therefore, DoD will obtain and possess the material in the capacity of a licensee under a licensee RIS.

e. Transfer Documents.

- (1) All transfers to DoD will be documented on DOE/NRC F 741 in accordance with the instructions in this Manual.
- (2) Preparation. Preparation of DOE/NRC F 741 will vary with the nature of the transfers, as indicated below.
  - (a) Transfer of Training Account Material. Complete instructions for such transfers are contained in Technical Manual, TP100-4, *Custody, Accountability, and Control of Nuclear Weapons and Nuclear Material*, published under the authority of the Secretaries of the Army, Navy, and Air Force for use by the Defense Special Weapons Agency and DOE. DOE elements that need this information should contact the NNSA Service Center.
  - (b) Transfer of War Reserve Stockpile Items Containing Nuclear Materials. Complete instructions for such transfers are contained in Section 3 of Technical Manual TP100-4.
  - (c) Other Transfers of SNM.
    - 1 Transfers of nuclear materials contained in Navy cores and associated items are reflected in DoD memorandum inventory accounts maintained by the Pittsburgh Naval Reactors Office. The distribution of DOE/NRC F 741 for such transfers will be in accordance with the distribution list in Chapter III, appropriately modified to provide copies to the Pittsburgh Naval Reactors Office. See paragraph 2 below.
    - 2 Other SNM Transfers under 42 U.S.C. §2121(b) are reflected in DoD memorandum inventory accounts maintained by the NNSA Service Center. The distribution of DOE/NRC F 741 for such transfers, excluding those described in paragraph 1a, above, will be in accordance with the distribution list in Chapter III, appropriately modified to provide copies to the NNSA Service Center as per paragraph 2 below.

2. DISTRIBUTION OF DOE/NRC F 741.

- a. Distribution of DOE/NRC F 741 for transfers of weapon-related materials is shown in Technical Manuals TP100-1 and TP100-4.
- b. Distribution of DOE/NRC F 741 for transfers of Navy cores and/or other SNM transfers is as follows.

- (1) Copies 1, 2, 3, and 5 are forwarded to the receiver.
- (2) Copy 4 is sent to the shipper's DOE cognizant security authority.
- (3) Copy 6 is forwarded, as appropriate, to either of the following.

U.S. Department of Energy  
Manager, NNSA Service Center  
PO Box 5400  
Albuquerque, NM 87115  
Attn: Manager, Technical Security Department (RIS AAA)

OR

U.S. Department of Energy  
Manager, Pittsburgh Naval Reactors Office  
P.O. Box 109  
West Mifflin, PA 15122-0109  
Attn: PAA Nuclear Material Representative

- (4) Copy 7 is retained by the shipper.
- (5) The shipper will instruct the receiver to—
  - (a) complete block 27 on copies 1, 2, 3, and 5;
  - (b) return copy 1 to the shipper;
  - (c) retain copy 2 for filing;
  - (d) mail copy 3 to the shipper's DOE cognizant security authority; and
  - (e) mail copy 5 to either the NNSA Service Center or the Pittsburgh Naval Reactors Office, as appropriate.

c. Other Transfers of Nuclear Material. All transfers of nuclear material under 42 U.S.C. §2121(b) will also be documented on DOE/NRC F 741. Distribution will be made as follows.

- (1) Copies 1, 2, 3, and 5 are forwarded to the receiver.
- (2) Copy 4 is sent to the shipper's DOE cognizant security authority.
- (3) Copy 6 is forwarded to—

Manager, NNSA Service Center  
National Nuclear Security Administration—USDOE  
P.O. Box 5400  
Albuquerque, NM 87115  
Attn: Manager, Technical Security Department (RIS AAA)

- (4) Copy 7 is retained by the shipper.
- (5) The shipper will instruct the receiver to—
  - (a) complete block 27 on copies 1, 2, 3, and 5;
  - (b) return copy 1 to the shipper;
  - (c) retain copy 2 for filing;
  - (d) mail copy 3 to the shipper's DOE cognizant security authority; and
  - (e) mail copy 5 to the address for the NNSA Service Center shown above.

3. MEMORANDUM INVENTORY ACCOUNTS.

- a. The Pittsburgh Naval Reactors Office and the NNSA Service Center will maintain memorandum inventory accounts for all transfers under their purview identified in paragraphs 1 and 2 above.
- b. The NNSA Service Center and the Pittsburgh Naval Reactors Office will maintain current inventory records that will provide the following information.
  - (1) All quantities shipped to DoD.
  - (2) All quantities returned to DOE (based on the receiver's measured quantities).
  - (3) All quantities determined to have been consumed or lost.
  - (4) Inventory and loss data for reports of composition of ending inventory.
- c. As of September 30 each year, the NNSA Service Center and the Pittsburgh Naval Reactors Office will forward transcripts of their memorandum accounts to the Director, Office of Nuclear Energy, Science and Technology, DOE Headquarters, for other than weapon-related inventories.

4. FROM DoD TO DOE.

- a. Transfer of training account material will be made by DoD as described in Technical Manual TP100-4, Section 3, for nuclear material transfers to U.S. DoD (RIS QZE) and Section 6 for transfers of SNM and source material to the training account (RIS QZC). The instructions prescribe the use of DoD Form 1348 to document the transfer.

- b. Transfer of war reserve stockpile items containing nuclear materials will be made by DoD as described in Technical Manual TP100-4, Section 3, for nuclear material transfers to U.S. DoD (RIS QZE). The instructions prescribe the use of DoD Form 1348 to document the transfer.
- c. DOE elements having need for information referred to in paragraphs 4a and 4b should contact the NMR at RIS AAA.
- d. Other than the transfers referred to above, DoD does not prescribe a form for the shipping DoD installation to document the transfer. However, for any such transfers, the receiving facility must provide DoD with appropriate acknowledgment of receipt, and ensure that DoD documentation of the transfer contains all essential information. In addition, the receiving facility is required to provide the NNSA Service Center or the Pittsburgh Naval Reactors Office with copies of any documentation of the transfer; i.e., receipt acknowledgment or DOE/NRC F 741, as appropriate. DOE line management must maintain a receipted copy of such documents for audit purposes. The basic information that should be included on the transfer document is as follows.
  - (1) Date of shipment.
  - (2) Name and address of the shipper.
  - (3) Description of the nuclear materials (including information as to the purpose for which it was used).
  - (4) Type of material.
  - (5) If available, the quantity of material by element and isotope.
  - (6) Date of receipt.
  - (7) Receiver's name and address.
  - (8) Signature of the receiving facility's authorized representative.
- e. Transfer Documents. All transfers of nuclear material from DoD will be documented on DOE/NRC F 741.
  - (1) Preparation. The receiver will prepare a DOE/NRC F 741 promptly, completing all appropriate blocks, with the exception of block 26, in accordance with the instructions in Chapter V.
  - (2) Distribution.
    - (a) One copy to the receiver's DOE cognizant security authority.



- (b) One copy to either the NNSA Service Center or the Pittsburgh Naval Reactors Office, as appropriate.
  - (c) One copy retained by the receiver.
- 5. PROHIBITION ON USE OF FOREIGN OBLIGATED MATERIAL. Material that has a foreign obligation attached under an Agreement for Cooperation in the Peaceful Uses of Nuclear Energy may not be shipped to or received by a facility with a Q RIS.

## **CHAPTER VII - NUCLEAR MATERIAL TRANSACTION REPORTING—U.S. AND FOREIGN NATIONS, FOREIGN REGIONAL ORGANIZATIONS, OR SUPRANATIONAL ORGANIZATIONS**

1. INTRODUCTION. This Chapter provides instructions for the preparation and distribution of DOE/NRC F 741 for transfers of nuclear material between the U.S. and foreign nations, foreign regional elements, or supranational organizations.
2. PREPARATION OF DOE/NRC F 741.
  - a. DOE organizations or contractors who ship to or receive nuclear materials from foreign entities will prepare DOE/NRC F 741.
  - b. For exports of nuclear material formerly under the INMTS guideline, the following information is designed to assist DOE and NMMSS in accounting for and controlling the export/import of nuclear materials. If the imported or exported nuclear material has foreign obligations, see Chapter VIII for further instructions. Additional information on export/import requirements can be obtained from the Office of Defense Nuclear Nonproliferation through DOE line management.
3. TRANSFERS TO A FOREIGN ENTITY.
  - a. The shipper will ensure that appropriate authorization and approval to transfer the nuclear material has been obtained. For exports, this may require either a specific license from the NRC Office of International Programs or a foreign contract number and Shippers Export Declaration (SED) from the Department of Commerce. Contact the cognizant DOE office for further instruction.
  - b. Foreign Contract Numbers and Shipper's Export Declarations.
    - (1) For Government to Government (typically lab to lab) transfers of relatively small quantities of nuclear material, an NRC export license may not be required. Fax a request for foreign contract number to the NMMSS operator. Include the receiving facility, country, end use, and type of transaction (sale, lease, donation, etc.). Contact the cognizant DOE office for request forms and further instruction.
    - (2) The NMMSS operator will complete the foreign contract number request with the appropriate RISs and the foreign contract number will be assigned and faxed back to the requesting facility.
    - (3) The facility will fax this information to the NMMSS operator prior to completing the 741 form to authorize the shipment.
    - (4) When a contract number is required, the contract number must be inserted in the transfer authority field (block 14) of the 741 form. When an SED is

required, the alphanumeric code for the SED must be inserted in the license field (block 15) of the 741 form. Contact the cognizant DOE office for additional information.

c. Specific Export Licenses:

- (1) For larger quantities of nuclear material that exceed specified threshold limits, a specific export license from the NRC Office of International Programs may be required. Contact the NRC Office of International Programs for further specific license information.
- (2) If required, the facility must complete an NRC Form 7, applying for a specific license.
- (3) Once the NRC has issued a license for the export (XSOU for source material, XB for byproduct material, XSNM for special nuclear material, XW for waste, etc.), the facility may ship the amount of specified material up to the authorized amount. The export of the authorized material may be in one or in many individual shipments.
- (4) When completing the 741 form for the export, the facility inserts the assigned export license number in the license field. The DOE contract (if any in block 9 of the NRC Form 7 application) should be inserted in the transfer authority field. If there is no DOE contract number, leave this field blank. If no license is required, the facility may enter LIC-EXEMPT in the license field. If the material is covered under a general license, the facility may enter GEN-LIC in the license field. It is important in preparing DOE/NRC F 741 that the entry in block 2 be the proper international nuclear facility code for the receiver's facility. (Refer to the NMMSS International Nuclear Facilities Codes Directory, which lists the names and corresponding RISs of international nuclear facilities identified to possess source and/or SNM and verified with the NMMSS Operator.)
- (5) The receiver's name and address, which are not necessarily the same as the name and address of the facility, will be entered in block 9a. This data is not captured by NMMSS.
- (6) Transfers of material under a mutual defense agreement will be identified by entering QZF in block 2 of DOE/NRC F 741 for transfers to France or QZG for transfers to the United Kingdom.
- (7) Owner code G (U.S. Government owned) or J (other owned), as appropriate, will be entered in block 26i to reflect material ownership.
- (8) Facilities engaged in the import and/or export of nuclear materials also will follow the special instructions in this Chapter and in Chapter VIII of

this Manual. No entry is required in block 15 for transfers of material under a mutual defense agreement. Transfers under 42 U.S.C. §2121(c) involving defense activities, other than those for which responsibility has been specifically assigned by Headquarters, must be coordinated through the Manager, NNSA Service Center.

- (9) In addition to any other markings, transfers of nuclear material to the United Kingdom must be reported in block 23c.

4. TRANSFERS FROM A FOREIGN ENTITY.

- a. The receiver, in preparing DOE/NRC F 741, will enter in block 1 the proper RIS for the shipper's facility. In block 8a, enter the shipper's name and address, which are not necessarily the same as the name and address of the facility. This data is not captured by NMMSS.
- b. Transfers of material under a mutual defense agreement will be identified by entering QZF in block 1 of DOE/NRC F 741 for transfers from France or QZG for transfers from the United Kingdom.
- c. Owner code G or J, as appropriate, will be entered in block 27i to reflect material ownership.
- d. No entry is required in block 15 for transfers of material under a mutual defense agreement. Transfers of material originally shipped under 42 U.S.C. §2121(c) involving defense activities, other than those for which responsibility has been specifically assigned by Headquarters, must be coordinated through the Manager, NNSA Service Center.
- e. In addition to any other markings, transfers of nuclear material from the United Kingdom must be reported in block 23c.
- f. Facilities engaged in the import and/or export of nuclear material will also follow the special instructions in this Chapter and Chapter VIII of this Manual.

5. BATCH FORMATION AND NAMING.

- a. For the import of material from a foreign nation or entity, use the shipper's batch identification.
- b. Reporting of inventory changes on DOE/NRC F 741 under the U.S./IAEA Safeguards Agreement is done at the batch level of detail; and under an agreement between the U.S. Government and the IAEA, imports and exports also will be reported at the batch level of detail.
- c. Special instructions for importers and exporters are in paragraph 6 of this chapter and in Chapters VIII and X of this Manual.

- d. Data on a batch are contained on a single detail line of DOE/NRC F 741. All material in a single batch must have the same value for all of the following data elements.
    - (1) Type of inventory change (required under the U.S./IAEA Safeguards Agreement only).
      - (a) Batch name.
      - (b) Number of items.
      - (c) Composition/facility code.
    - (2) Key measurement point (required under the U.S./IAEA Safeguards Agreement only).
    - (3) Measurement identification code, i.e., measurement basis, other measurement point, and measurement method (required under the U.S./IAEA Safeguards Agreement only).
  - e. If the material in a single batch has multiple values for data elements, the data for the batch must be listed on two or more detail lines, with common data elements repeated. An example of a batch requiring more than one line would be irradiated fuel containing both uranium and plutonium. The data for such a batch would be listed using one line for uranium data and one line for plutonium data.
6. SPECIFIC INSTRUCTIONS FOR FACILITIES ENGAGED IN THE IMPORT AND/OR EXPORT OF NUCLEAR MATERIALS.
- a. U.S. importers and/or exporters of nuclear materials are required to use DOE/NRC F 741 for documentation of all transactions. In addition, U.S. facilities involved in importing or exporting are required to complete the portion of the DOE/NRC F 741 normally completed by the other facility involved in a transfer.
    - (1) U.S. importers and exporters will complete both the shipper's and the receiver's portion of the form.
    - (2) The required signing of the non-DOE portion of a DOE/NRC F 741 will indicate only that the signing individual is authorized to provide the information to the NMMSS and will not imply any responsibility for proper shipment or receipt of the materials reflected on the non-DOE side of the document.

- (3) These facilities will complete the numbered blocks on DOE/NRC F 741 as specified in the main body of Chapters II, III, IV, and V of this Manual.
- b. The following instructions are specific for importers and exporters of nuclear materials and apply only to shipments containing 1 gram or more of SNM or 1 kilogram or more of source material.
  - (1) **Block 1, Shipper's RIS.** The U.S. exporting facility will enter its RIS in block 1. The U.S. importing facility will enter the foreign shipper's RIS from the NMMSS International Nuclear Facilities Codes Directory.
  - (2) **Block 2, Receiver's RIS.** The U.S. exporting facility will enter the foreign receiver's RIS from the NMMSS International Nuclear Facilities Codes Directory. The U.S. importing facility will enter its RIS.
- c. **Block 14, Transfer Authority.** For exports, the U.S. exporter will enter the authorizing contract or foreign contract number as applicable, in accordance with the procedures set forth in this chapter, under Section 3, Transfers to a Foreign Entity. For imports, the U.S. importer will enter the authorizing contract, if applicable.
- d. **Block 15, Export or Import Transfers, License Number.** The U.S. facility will enter the appropriate authorizing SED number or specific license number in this field if applicable. If no SED or license is required, the facility can enter LIC-EXEMPT or GEN-LIC for a general license. See Chapter IV for further guidance.
- e. **Block 23c, U.K. Reportable.** U.S. exporters or importers involved in a transfer with the United Kingdom will enter the transfer category in this block by checking one of the following.
  - (1) A transfer of material pursuant to the U.S./U.K. Mutual Defense Agreement, check NO.
  - (2) A transfer of material for military use but not pursuant to the U.S./U.K. Agreement, check NO.
  - (3) A transfer of material for peaceful use, check YES.
- f. **Block 26d, Identification (Item/Batch Name).**
  - (1) A U.S. facility that is an exporter completing the shipper's data will create a batch name that will be unique to that transaction within the facility. For fuel assemblies, pins, sealed sources, and UF<sub>6</sub> cylinders, the batch name will be its identification number. In addition, fuel assemblies, pins, sealed sources, and UF<sub>6</sub> cylinders will each be separate batches.

- (2) A U.S. facility that is an importer completing the shipper's portion of the data for the foreign facility will obtain and use the shipper's batch name as provided by the shipper.
- (3) If data previously reported on a batch are being corrected, the same batch name must be used on the correction document as on the original document. If the batch name is being corrected, the "was" line should show the batch name originally reported and the "should be" line should show the correct batch name.

g. **Block 26g, Material Type.**

- (1) A U.S. facility that is an exporter completing the shipper's data will enter the correct U.S. MT code from Table XV-2.
- (2) A U.S. facility that is an importer completing the shipper's data for a foreign facility will convert the IAEA element code provided by the shipper to the U.S. MT code from Table XV-14. If the foreign facility does not provide an IAEA element code, the U.S. facility will supply the appropriate U.S. MT code and attach a Concise Note to this effect.

h. **Block 27d, Identification (Batch Name).** Whether the U.S. facility is an importer completing the receiver's data or an exporter completing the receiver's portion of the data for a foreign facility, the U.S. facility will enter the same batch name as entered in block 26d.

i. **Block 27g, Material Type.**

- (1) A U.S. facility that is an importer completing the receiver's data will enter the correct U.S. MT code from the list of material types in block 26g.
- (2) A U.S. facility that is an exporter completing the receiver's data for the foreign facility will enter the same MT code as entered in block 26g.

j. **Blocks 17-21, Obligation Information.** For imports or exports involving foreign obligated material, the U.S. facility will complete these fields as described in Chapter VIII. NOTE: Only EURATOM<sup>2</sup> and U.S. non-obligated material may be transferred under a Mutual Defense Agreement.

7. DISTRIBUTION OF DOE/NRC F 741. Distribution of DOE/NRC F 741 data will be in accordance with the following procedures.

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<sup>2</sup> EURATOM comprises the following member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden, and the United Kingdom

- a. Secondary Distribution of DOE/NRC F 741. The NMMSS (QFA) will make secondary distribution of DOE/NRC F 741 at the close of the process month for the countries/entities with which the United States has bilateral agreements for cooperation that require report distribution. This distribution is made for Australia, Canada, EURATOM, and Japan through the DOE/NNSA Office of International Regimes and Agreements.
- (1) For transactions involving 42 U.S.C. §2121(c), Material for EURATOM, the shipper must prepare and distribute an additional copy of the receipted DOE/NRC F 741 to the NNSA Service Center.
- (2) Copy 2 of DOE/NRC F 741 will accompany the shipment if it contains 1 or more grams of SNM or 1 or more kilograms of source material.
- b. For Transfers of Material to or from the United Kingdom (QZG) under the Mutual Defense Program, the distribution instructions below will apply.
- (1) If the data documenting the transfer is classified RD/FRD, 9 copies are to be distributed as follows.
- (a) Copies 1–5
- 1 OUTER ENVELOPE
- Chief, Joint Atomic Information Exchange Group  
8725 John J Kingman Road  
Mail Stop 6201  
Ft. Belvoir, VA 22060-6201  
Attn: JAIEG
- 2 INNER ENVELOPE
- Chief, Joint Atomic Information Exchange Group  
8725 John J Kingman Road  
For: (name of recipient)  
Ft. Belvoir, VA 22060-6201  
Attn: JAIEG
- (b) Copy 6.
- 1 OUTER ENVELOPE
- U.S. Department of Energy  
P.O. Box 23865  
Washington, D.C. 20026-3865



2 INNER ENVELOPE

U.S. Department of Energy  
NNSA Office of Operations and Construction Management  
P.O. Box 23865  
Washington, D.C. 20026-3865

(c) Copy 7.

Chief, Joint Atomic Information Exchange Group  
Defense Special Weapons Agency  
6801 Telegraph Road  
Alexandria, VA 22310-3398

(d) Copy 8.

NNSA Service Center  
P.O. Box 5400  
Albuquerque, NM 87115  
Attn: Manager, Technical Security Department

(e) Copy 9. Retain for internal use.

(f) The shipper/receiver will include a letter of transmittal to the Chief, Joint Atomic Information Exchange Group requesting that copies 1 through 5 of DOE/NRC F 741 be forwarded [for ultimate transmittal to Atomic Weapons Establishment (AWE)] to—

British Embassy  
Washington, D.C.  
Attn: Atomic Coordinating Office

(2) If the transfer represents a loan of weapons material, both the DOE/NRC F 741 and the letter of transmittal should include a reference to a U.S. loan authorization.

(3) If the transfer represents a sale of nuclear material to the United Kingdom, record the transaction as Purchased by Aldermaston (PALD) or Purchased by Aviation Ministry (PAM) sales authorization, as appropriate.

(4) The shipper/receiver also should instruct the British Defense Staff to sign two copies of the DOE/NRC F 741 documenting the transfer, and to forward one copy to the DOE shipper/receiver and one copy to—

NNSA Service Center  
RIS AAA  
P.O. Box 5400  
Albuquerque, NM 87115  
Attn: Manager, Technical Security Department

- (5) If the DOE/NRC F 741 documenting the transfer is unclassified, or classified NSI, three copies (copies 6 and copies 8–9) of the form are to be distributed according to the locations noted above. Copy 1-5 and 7 are not required by the Joint Atomic Information Exchange Group; however, copies 1-5 are to be distributed to the U.S. DOE locations noted above.

## **CHAPTER VIII - NUCLEAR MATERIAL TRANSACTION REPORTING—FOREIGN OBLIGATIONS TRACKING FOR DOE/NRC F 741 BLOCKS 17, 18, 19, 20, AND 21**

### **1. INTRODUCTION.**

- a. Special procedures must be used to implement the reporting requirements of the U.S. Bilateral Agreements for Peaceful Nuclear Cooperation. These agreements for cooperation are necessary to allow the U.S. Nuclear Industry to trade with foreign countries/entities, per Section 123 of the Atomic Energy Act of 1954.
- b. The agreements require that the U.S. track and report the foreign-obligated nuclear materials and produced nuclear materials from these countries/entities within the boundaries of the U.S.
- c. A foreign obligation can be defined as a commitment by one government to another to treat nuclear materials, nonnuclear materials, equipment and components in a manner consistent with the agreement signed between the two governments.
- d. In addition to these agreements for cooperation, the U.S. has a requirement to track and report to Russia the imports, exports, and use of the Former Soviet Union down-blended highly-enriched uranium.
- e. Facilities that are importers and/or exporters of nuclear material also should comply with Chapters VII and IX.

### **2. PROHIBITION ON USE OF FOREIGN OBLIGATED MATERIAL.** Material that has a foreign obligation attached under an Agreement for Cooperation in the Peaceful Uses of Nuclear Energy may not be shipped to or received by a facility with a Q RIS.

### **3. IMPORTS.**

- a. For U.S. facilities importing nuclear material with foreign obligations, the relevant obligation information will be supplied by the appropriate Government agency (DOE, Department of State, and NRC) in advance of the receipt. This Government notification will supply the U.S. facility with the information necessary to complete blocks 17-21, if applicable.
- b. For imports, the foreign obligation information can be—
  - (1) country/entity from which the nuclear material was shipped, and/or
  - (2) country/entity attaching third-party obligations.
  - (3) In most cases, for imports from a country that has made the entire shipment subject to the agreement, the total import quantity will be obligated. If only a portion of the shipment is subject to an agreement

(third party obligation), that amount will be clearly specified on the documentation. These will be identified as such in the Government notification supplied to the U.S. facility in advance of the import.

- c. The Government notification will supply the following information for the completion of blocks 17–21:
  - (1) the country/entity code of obligation,
  - (2) the material type, and
  - (3) the amount obligated.
- d. See Table XV-15 for country/entity codes. See Table XV-16 for reportable obligated material types and quantities.

4. COMPLETION OF OBLIGATION INFORMATION.

- a. **Block 17, Line Number.** The facility will enter a sequential number (01 through 99) for each obligated country or material. If there is more than one separate obligation or more than one obligated material type, enter the appropriate numbers in the subsequent lines.
- b. **Block 18, Country of Obligation.** For each obligation line, enter the code from Table XV-15 that represents the country/entity of obligation.
- c. **Block 19, Material Type.** For each obligation line, enter the domestic code from Table XV-16 that represents the material obligated. The only material types to be reported are 10, 20, 50, 70, 81, and 88.
- d. **Block 20, Obligated Element Weight.** Enter the element weight of the amount obligated. Refer to Table XV-16.
- e. **Block 21, Obligated Isotope Weight** (for Enriched Uranium in U-235 and or U-233 only). Enter the isotope weight of the amount obligated to the nearest gram.

5. DOMESTIC TRANSFERS, INTERNAL TRANSACTIONS, AND EXPORTS.

- a. For U.S. facilities shipping or exporting material with foreign obligations or for the reporting of onsite gains and losses, the obligations on the material must be stated as such in blocks 17–21.
- b. For domestic transfers, blocks 17–21 will be filled out as explained in paragraph 4 above.
  - (1) The U.S. shipper will assign the appropriate obligations on the material, if

any, and complete the line number, country/entity of obligation, material type and obligated weight entries, as applicable.

- (2) The U.S. receiver will complete the matching obligation information as assigned by the shipper, if accepting shipper's values. If receiver does not accept shipper's weights, the receiver's weights will be recorded for the foreign obligated material.
- c. For internal transactions (e.g., burn-up, decay, production, measured discards, accidental losses or gains, category changes, fission and transmutation, inventory differences, etc.), enter the line number, country/entity of obligation, material type and obligated weights, if applicable.
- d. For exports, the U.S. shipper will complete, the shipper's and receiver's DOE/NRC F 741.
- e. If the U.S. shipper is exporting foreign obligated material, the U.S. shipper will complete blocks 17–21 for each obligated country/entity or material exported.  
NOTE: If the export requires a NRC export license, the license should specifically permit the export of that obligated material on the face of the license. See Chapters VII and IX for additional information on imports and exports.

## **CHAPTER IX - NUCLEAR MATERIAL TRANSACTION REPORTING—FACILITIES SELECTED BY THE IAEA**

### **1. INTRODUCTION.**

- a. Special procedures must be used to implement some of the reporting requirements of the U.S./IAEA Safeguards Agreement.
- b. This Chapter provides direction for use of these special procedures for facilities that have been selected either under the terms of the U.S./IAEA Safeguards Agreement or Protocol. Such facilities should note that all requirements and procedures in the main body of this Manual apply, in addition to the special requirements of this Chapter.
- c. Facilities selected under the U.S./IAEA Safeguards Agreement that are importers and/or exporters of nuclear material also should comply with Chapters VII and VIII.
- d. For further guidance, refer to Code 10 of the Subsidiary Arrangements to the U.S./IAEA Safeguards Agreement.

### **2. BATCH FORMATION AND NAMING.**

- a. Reporting of inventory changes on DOE/NRC F 741 under the U.S./IAEA Safeguards Agreement is at the batch level of detail.
- b. In general, the data on a batch are contained on a single detail line of DOE/NRC F 741.
- c. All material in a single batch must have the same value for all of the following data elements:
  - (1) type of inventory change,
  - (2) batch name,
  - (3) number of items,
  - (4) composition/facility code,
  - (5) key measurement point, and
  - (6) measurement identification code (i.e., measurement basis, other measurement point, and measurement method).

- d. If the material in a single batch has multiple values for data elements, the data for the batch must be listed on two or more detail lines, with common data elements repeated. An example of a batch requiring more than one line would be irradiated fuel containing both uranium and plutonium. The data for such a batch would be listed using one line for uranium data and one line for plutonium data.
- e. If a facility selected by the IAEA receives a shipment, the receiver's data must be reported with a one-to-one, line-by-line correspondence to the shipper's data rather than at the batch level of detail.
- f. If inventory change code 22 or 71 is entered in block 26c or 27c, as applicable, the batch name in block 26d or 27d must be composed of the appropriate character code from Table XV-18, followed by a unique sequence number (e.g., EN-800423). (The IAEA does not require the reporting of category changes of enrichment for enriched uranium.) For each entry with an inventory change code of 22, there must be a corresponding entry with an inventory change code of 71 with the same batch name.
- g. Guidance for reporting de-exemption for use or quantity and exemption for use, quantity, or termination due to non-nuclear use will be provided by the Office of Resource Management, and the Office of International Regimes and Agreements. A description of de-exemption codes (e.g., DU, DQ, EU, EQ, etc.) is given in Code 10 of the Subsidiary Arrangements to the U.S./IAEA Safeguards Agreement.

### 3. DETAILED INSTRUCTIONS.

- a. Facilities selected by the IAEA are required to use DOE/NRC F 741 for documentation of all transactions, including transfers between the IAEA material balance areas (MBAs) within the facility and certain other types of onsite inventory changes. Specific instructions for these onsite inventory changes will be provided by the Office of International Regimes and Agreements on a case-by-case basis.
- b. Facilities notified of selection by the IAEA will complete the numbered blocks on DOE/NRC F 741 as specified in Chapters XII, XIII, and XIV of this Manual with the following additional requirements.
  - (1) **Block 23b, Concise Note Attached.** The domestic shipper or receiver places an X in the appropriate box to indicate whether or not a Concise Note is attached to the DOE/NRC F 741.
  - (2) **DOE/NRC F 740M.** A Concise Note will be used by the shipper or receiver to supply additional nuclear materials transaction data in free text format, either at the reporting facility's option or as required by the facility

attachment or transitional facility attachment. See Chapter X for further information on Concise Notes.

(3) **Block 26, Shipper Data.**

- (a) **Block 26c, Type of Inventory Change.** When reporting types of transactions denoted by codes DU, DQ, EU, EQ, or TU, a special code will be required in this block. Special codes and procedures will be provided by the Office of International Regimes and Agreements on a case-by-case basis.
- (b) **Block 26d, Identification (Item/Batch Name).**
  - 1 The shipper will create a unique batch name. For guidance regarding the number of characters in a batch name, contact the NMMSS operator. For fuel assemblies, pins, sealed sources, and UF<sub>6</sub> cylinders, the batch name will be its identification number. A batch name will not appear more than once on a single DOE/NRC F 741 unless the data for a single batch requires more than one line.
  - 2 If inventory change code 22 or 71 is entered in block 26c or 27c or transaction code DU, DQ, EU, EQ, or TU is being reported, see Chapter VII of this Manual for guidance in constructing a batch name.
  - 3 If data previously reported on a batch is being corrected, the same batch name must be used on the correction document as on the original document. If the batch name is being corrected, the “was” line should show the batch name originally reported and the “should be” line should show the correct batch name.
- (c) **Block 26h, Composition/Facility Code.** Special codes and procedures will be provided by the Office of International Regimes and Agreements on a case-by-case basis.
- (d) **Block 26j, Key Measurement Point.** Enter the appropriate flow key measurement point code of the facility attachment or transitional facility attachment.
- (e) **Block 26k, Measurement Identification** consists of measurement basis, other measurement point, and measurement method as shown below.



- 1      Measurement Basis. Enter the appropriate code from the following list.
  - a      N—batch data are based on measurements made at another MBA, and this is the first time the data are being reported for this MBA.
  - b      L—batch data are based on measurements made at another MBA, the data are being reported for the MBA and this is the second, third, etc., time.
  - c      M—batch data are based on measurements made at this MBA, and this is the first time the data are being reported for this MBA.
  - d      T—batch data are based on measurements made at this MBA, and this is the second, third, etc., time the data are being reported for this MBA.
- 2      Other Measurement Point. If an M was entered for the measurement basis, enter the appropriate code to indicate the key measurement point if different from the key measurement point indicated by the code in block 26j.
- 3      Measurement Method. If two or more measurement methods having different measurement uncertainties may be employed at a particular key measurement point, enter the appropriate code to indicate the method used for measurement, as agreed with the IAEA.

c.      **Block 27, Receiver's Data.**

- (1)      **Block 27c, Type of Inventory Change.** Fill out as per instructions above for block 26c.
- (2)      **Block 27d, Identification** (Item/Batch Name). Enter the same batch name as the shipper entered in block 26d.
  - (a)      If a batch name has not been assigned, see Chapter VII of this Manual for guidance in constructing a batch name.
  - (b)      If the material is being imported, the receiver will use the batch name provided by the shipper.
- (3)      **Block 27h, Composition/Facility Code.** Fill out as per instructions above for block 26h.

- (4) **Block 27j, Key Measurement Point.** Fill out as per instructions above for block 26j.
- (5) **Block 27k, Measurement Identification.** Fill out as per instructions above for block 26k.

## **CHAPTER X - NUCLEAR MATERIAL TRANSACTION REPORTING— CONCISE NOTE**

1. INTRODUCTION. Facilities are to submit a Concise Note under the following circumstances.
  - a. Facilities selected under the U.S./IAEA Safeguards Agreement or Protocol are required to submit Concise Notes to accompany submission of transaction, material balance and physical inventory data, as appropriate, for conveying explanatory information to the IAEA.
  - b. Facilities engaged in the import and/or export of nuclear materials that for any reason cannot use the same batch name as the shipper or if the shipper fails to supply a batch name, the importer should supply his own batch names and attach a Concise Note to that effect.
  - c. If the shipper fails to supply its IAEA facility code or the IAEA material type code, a Concise Note should be prepared stating that the data was not supplied.
  - d. Facility attachments or transitional facility attachments for selected facilities may specify circumstances under which Concise Notes are required to be submitted to the IAEA accompanying other reports. Such Concise Notes are used to convey to the Foreign State the required data items associated with reported accounting data.
2. INSTRUCTIONS FOR COMPLETING DOE/NRC FORM 740M.
  - a. **Block 1, Name and Address.** Leave blank.
  - b. **Block 2, Attachment to.** Place a check mark or an X in the appropriate box to indicate whether this explanatory information will be attached to a DOE/NRC F 741, 742, or 742C.
  - c. **Block 3, RIS.** Enter the RIS for your facility to which the explanatory information in this report applies.
  - d. **Block 4, Reporting Period.** Complete this block if 2b or 2c was checked, indicating that this concise note is attached to a DOE/NRC F 742C, Physical Inventory Listing. Enter the beginning and ending dates of the reporting period as shown on DOE/NRC F 742 or F 742C.
  - e. **Block 5, Transaction Data.** Complete this block only if box 2a was checked, indicating that this F 740M is attached to a DOE/NRC F 741. All entries in this block must be identified to those on the DOE/NRC F 741. Fill in the blocks as follows.
    - (1) **Block 5a.** Enter shipper's RIS.

- (2) **Block 5b.** Enter receiver's RIS.
  - (3) **Block 5c.** Enter the unique transaction number.
  - (4) **Block 5d, Correction Number.** Used when DOE/NRC F 741 is a correction to a previous report.
  - (5) **Block 5e, Processing Code.** Enter the same code as was used in the DOE/NRC F 741.
  - (6) **Block 5f, Action Code.** If a DOE/NRC F 740M is attached enter the same action code as in block 6 of the DOE/NRC F 741. Otherwise enter action code M.
- f. **Block 6, Reporting Date.** Complete this block if box 2a or 2c was checked. Copy the date shown on DOE/NRC F 741 or 742C.
- g. **Block 7.** The actual explanatory data and the other data necessary to link the explanatory data to the parts of the report to which they apply. Complete this block as follows.
- (1) **Block 7a, Line Number.** Enter the consecutive number beginning with one (01) for each explanatory reference.
  - (2) **Block 7b, Entry Reference.**
    - (a) If the explanatory information entered on this line of the DOE/NRC F 740M applies to the entire DOE/NRC F 741, 742, or 742C, enter the words, "Whole Report."
    - (b) If the explanation applies to the data on a specific batch on a DOE/NRC F 741 or 742C, copy the batch name exactly as it appears on DOE/NRC F 741 or 742C.
    - (c) If the explanation applies to a specific material balance category on a DOE/NRC F 742, enter the two-digit number of the material balance category.
    - (d) If the explanation applies to material balance categories 11, 30, 42, 43, or 51, enter the RIS shown on the line of the DOE/NRC F 742.
    - (e) If the explanation applies to categories 22 or 71, enter the 2-character inventory change type (ICT) as shown on that line of the DOE/NRC F 742.
    - (f) If DOE/NRC F 740M action code is M, enter "General."

- (3) **Block 7c, Text of Concise Note.** Enter any 43 characters, letters, numbers, or special characters per line. Up to 99 lines of text may be used for any one explanation.
- h. **Block 8.** The DOE/NRC F 740M is to be signed by an authorized representative of the facility.
- i. **Block 9.** Enter the title of the person signing the form.
- j. **Block 10.** Enter the date the form was signed.
- k. Computer-Readable Format. DOE/NRC F 740M may be put into computer-readable format following additional guidance in NMMSS Reports D-22 and D-23.
- l. Distribution.
  - (1) The Concise Note will be submitted at the same time as the submission of the data to which the Concise Note refers.
  - (2) If associated with a DOE/NRC F 741, 742, and/or 742C, copies of DOE/NRC F 740M will be attached as applicable.
  - (3) Under certain circumstances, a DOE/NRC F 740M can be submitted as a stand alone document (e.g., to comply with IAEA reporting requirements).

## CHAPTER XI - MATERIAL BALANCE REPORTING

### 1. INTRODUCTION.

- a. This Chapter provides instructions to DOE license-exempt contractors and NRC and Agreement State licensees that are DOE contractors for the preparation and distribution of DOE/NRC F 742, Material Balance Report, (MBR) or its electronic equivalent.
- b. Chapter XII contains special MBR instructions for facilities that have been selected under the terms of either the U.S./IAEA Safeguards Agreement or Protocol. The calculations for, and preparation of, the MBR to be provided to the IAEA will be performed by NMMSS. Before the report is dispatched to the IAEA, NMMSS will provide a copy to the facility concerned to ensure that the data is correct.
- c. A MBR must be prepared either by the NMMSS operator or by the facility. A facility may place a standing request with NMMSS to have an NMMSS-generated MBR, DOE/NRC F 742, provided to the facility in lieu of submission of reports. In such cases, the facility that receives the NMMSS-generated report must reconcile the facility's balances to the NMMSS. Reconciling transactions must be submitted if NMMSS balances are to be changed.
- d. MBRs must be submitted—
  - (1) annually, by September 30 for all facilities and additionally as directed by the DOE cognizant security authority; or
  - (2) as specified in facility attachments or transitional facility attachments for DOE facilities selected under the provisions of the U.S./IAEA Safeguards Agreement.
- e. Nuclear material in transit at the end of a reporting period will be included in the receiver's reported inventory as if it had reached the intended receiver within the reporting period (in transit rule).
- f. Radioactive decay will be reported on MBRs on an annual basis when the decay has reached reportable quantities or at a more frequent reporting interval if required by the DOE cognizant security authority.

2. CLASSIFICATION AND SECURITY REQUIREMENTS. The submitted MBR, whether submitted on paper or electronically, will be classified using appropriate classification guidance and following the procedures contained in DOE M 475.1-1A, *Identifying Classified Information* and will be marked with appropriate classification markings and transmitted following procedures contained in DOE M 470.4-4, *Information Security*.

3. REPORTING UNITS.

- a. Quantities will be reported by element and isotope weight in metric units. Refer to Tables XV-2 and XV-17.
- b. Enter the element weight, i.e., total weight of all isotopes contained in the element being reported in column A.
- c. Enter the isotope weight, i.e., weight of the isotopes for the element being reported in column B.
- d. Convert volume measurements that have been made or records that are kept in volume units to the reporting unit for the material type.
- e. If the degree of precision to which facility records are kept is greater than that required for reporting purposes, the rounding procedures defined in Chapter II, paragraph 6 will be used.

4. INSTRUCTIONS FOR COMPLETING DOE/NRC F 742. Data submitted on paper will be reported as follows.

- a. **Block 1.** Enter the name and address of the facility.
- b. **Block 2.** Enter the appropriate possession license numbers if the reporting facility is a licensed contractor.
- c. **Block 3, RIS.** Enter the RIS under which the material being reported is or was held. Submit a separate DOE/NRC F 742 for each RIS.
- d. **Block 4, Report Period.** Enter inclusive dates (MM/DD/YYYY).
- e. **Block 5, Material Type.** Enter the name of the material (See Table XV-1).  
NOTE: Submit a separate report for each type.
- f. **Block 6a, Process Code.** Leave blank.
- g. **Block 6b, Correction ID.** Leave blank.
- h. **Block 7, DOE/NRC F 740M Attached.** Only required for facilities selected under the U.S./IAEA Safeguards Agreement.
- i. **Line 8, Beginning Inventory—U.S. Government Owned.** Enter inventory of U.S. Government owned material as of opening of business on the first day of the report period covered by the DOE/NRC F 742. These figures will not differ from line 80 of the DOE/NRC F 742 submitted at the close of the preceding report period.

- j. **Line 9, Beginning Inventory—Not U.S. Government Owned.** Enter inventory of non-DOE-owned material as of the opening of business on the first day of the report period covered by the DOE/NRC F 742. These figures will not differ from line 81 of the DOE/NRC F 742 submitted at the close of the preceding report period.
- k. **Line 11, Procurement from DOE.** Enter quantities of material purchased from DOE during the report period. (Quantities entered on line 11 will not be entered on line 30.)
- l. **Line 13, Procurement for the Account of DOE.** Enter quantities of material procured from domestic and foreign sources that increase the assets of DOE. Returns of DOE-owned leased material from licensees and foreign entities will be entered on line 30. The following are examples of procurement to be reported on line 13.
  - (1) Material acquired under the terms of an international agreement for cooperation with foreign entity.
  - (2) Material previously sold by DOE to a licensee or foreign entity and then repurchased by DOE.
  - (3) Material procured from private owners.
- m. **Line 14, DoD Returns—Use A.** Enter quantities of material in returns of weapons and weapons components issued to DoD under Presidential directive.
- n. **Line 15, DoD Returns—Use B.** Enter quantities of material contained in returns of training material issued to DoD under Presidential directive.
- o. **Line 16, DoD Returns—Other Uses.** Enter quantities of material in returns of reactor cores, fission chambers, and other material issued to DoD under Presidential directive for use in military non-weapons programs (e.g., nuclear research and development, propulsion, or electric power generation programs).
- p. **Line 21, Production.** Enter quantities of material obtained through transmutation.
  - (1) For production reactors, production will be reported in the period during which transmutation takes place in the reactor.
  - (2) For reactors other than production reactors, production will be reported no less often than upon discharge from the reactor. If the operation of the reactor for the year long period October 1 through September 30, results in nuclear production of 5 kilograms or more of enriched uranium or plutonium, production must be reported on DOE/NRC F 742 as of September 30, and no less often than annually.



- (3) Differences between reactor calculations and dissolution measurements will be reported on line 21. Production of insignificant quantities of material (quantity is less than 0.5 of the reporting unit for a specific material type), as in a materials testing reactor, need not be reported unless the material is to be recovered or a reporting requirement is imposed by the DOE cognizant security authority.
- q. **Line 22, From Other Materials.** Enter receipts from other material balances as a result of intentional blending or crossovers. Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter XII for additional requirements. Examples of receipts to be reported on line 22 are given below.
- (1) In a production reactor, normal uranium will become depleted uranium during operation of the reactor. Line 22 on the depleted uranium MBR for the facility operating the reactor will indicate receipts from the normal uranium balance. Correspondingly, line 71 on the normal uranium MBR for the facility will reflect removals to the depleted uranium balance.
- (2) The blending of depleted and enriched uranium in the proper proportions will result in normal uranium. Line 22 on the normal uranium MBR will indicate receipts from the depleted and enriched uranium balances. Correspondingly, line 71 on the depleted and enriched uranium MBRs will reflect removals to the normal uranium balance.
- r. **Line 30, Receipts Reported to DOE/NRC (on DOE/NRC F 741).** Enter, by transfer series, all receipts for the report period not entered on lines 11-16, 34, 37, 38, and 39. If more space is needed than is provided on DOE/NRC F 742, prepare a sub-schedule entitled "Receipts Reported to DOE/NRC on DOE/NRC F 741 (not listed elsewhere)." Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter XII for additional requirements.
- s. **Line 34, Receipts—Miscellaneous.** Enter quantities of material received in two-party transactions where only receiver's data are reported. Examples include receipts of material (not reported elsewhere) from facilities that have not been assigned a RIS, and receipts from licensees that are not required to document or report transactions.
- t. **Line 37, Procurement by Others.** Enter quantities of material purchased by the facility for its own account from *in situ* material, which it had been holding under lease from the DOE, or, material that the facility is processing for a non-DOE facility against a non-DOE purchase order.
- u. **Line 38, Donated Material—from U.S. Government to Others.** Enter quantities of material donated, i.e., change in ownership without transfer of funds, which increase the reporting facility's non-U.S. Government-owned inventory and decrease the assets of the U.S. Government.

- v. **Line 39, Donated Material—from Others to the U.S. Government.** Enter quantities of material donated, i.e., change in ownership without transfer of funds, which increase the assets of U.S. Government and decreases the reporting facility's non-U.S. Government owned inventory.
- w. **Line 40, Total.** Enter the total of lines 8–39.
- x. **Line 41, Expended in Space Programs.** Enter quantities of material transferred for use in a space vehicle (e.g., for propulsion or nuclear auxiliary power system). The reporting facility will provide the DOE cognizant security authority the following details with respect to ultimate disposition of the material.
  - (1) Date vehicle was launched into space or placed into orbit, or if vehicle misfired or failed to orbit, losses of material associated therewith (if attempts at recovery have been made and there is some recovery, only material not recovered will be reported on line 41).
  - (2) Project name.
  - (3) Launch site.
  - (4) Any other pertinent information.
- y. **Line 42, Sales to U.S. Government.** Enter quantities of material sold during the reporting period. (Quantities entered on line 42 will not be entered on line 51.)
- z. **Line 43, Sales to Others for the Account of U.S. Government.** Enter quantities of U.S. Government owned material sold to other Government agencies, licensees, and foreign entities.
- aa. **Line 44, DoD—Use A.** Enter quantities of material in shipments of weapons and weapons components to DoD under Presidential directive.
- bb. **Line 45, DoD—Use B.** Enter quantities of material in shipments of Training Material to DoD under Presidential directive.
- cc. **Line 46, DoD—Other Uses.** Enter quantities of material in shipments of reactor cores, fission chambers, and other material to DoD under Presidential directive for use in military non-weapons programs (e.g., nuclear research and development, propulsion, or electric power generation programs).
- dd. **Line 47, Expended in U.S. Government Tests.** Enter quantities of material expended in U.S. tests authorized by the President.
- ee. **Line 48, Routine Tests.** Enter quantities of source material expended in routine testing associated with weapons-related research and development activities. The

use of line 48 for the reporting of other than source material requires prior approval by the DOE cognizant security authority.

- ff. **Line 49, Shipper-Receiver Difference.** Leave blank.
- gg. **Line 51, Shipments Reported to DOE/NRC** (on DOE/NRC F 741). Enter, by transfer series, all shipments for the reporting period not entered on lines 42–46, 54, 58, and 59. If more space is needed than is provided on DOE/NRC F 742, prepare a sub schedule entitled “Shipments Reported to DOE/NRC on DOE/NRC F 741 (not listed elsewhere).” Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter XII for additional requirements.
- hh. **Line 54, Shipments—Miscellaneous.** Enter quantities of material shipped in two-party transactions where only shipper’s data are reported. Examples include shipments (not reported elsewhere) to facilities that have not been assigned a RIS, and shipments to licensees that are not required to document or report transactions.
- ii. **Line 58, Donated Material—to U.S. Government by Others.** Enter quantities of material donated i.e., change in ownership without transfer of funds, which decrease the reporting facility’s non-U.S. Government owned inventory and increase the assets of the U.S. Government.
- jj. **Line 59, Donated Material—to Others by the U.S. Government.** Enter quantities of material donated i.e., change in ownership without transfer of funds, which decrease the assets of the U.S. Government and increase the reporting facility’s non-U.S. Government owned inventory.
- kk. **Line 65, Rounding Bias.** Enter any rounding bias quantity that is technically supportable.
- ll. **Line 71, Degradation to Other Materials.** Enter removals to other material balances as a result of intentional blending degradation, or crossovers. Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter XII for additional requirements. Examples of removals to be reported on line 71 are given below.
  - (1) In a production reactor, normal uranium will become depleted uranium during operation of the reactor. Line 71 on the normal uranium MBR for the facility operating the reactor will indicate removals to the depleted uranium balance. Correspondingly, line 22 on the depleted uranium MBR for the facility will reflect receipts from the normal uranium balance.
  - (2) The blending of depleted and enriched uranium in the proper proportions will result in normal uranium. Line 71 on the depleted and enriched uranium MBRs will indicate removals to the normal uranium balance.

Correspondingly, line 22 on the normal uranium MBR will reflect receipts from the depleted and enriched uranium balances.

- mm. **Line 72, Decay.** Apply the appropriate decay factor as indicated in Chapter XV and enter the calculated radioactive decay on line 72.
- nn. **Line 73, Fission and Transmutation.** Enter quantities of material consumed as a result of exposure in a device.
  - (1) For DOE production reactors, material consumed will be reported on a current basis, i.e., as transmutation and burn-up take place in the reactor.
  - (2) For reactors other than production reactors, material consumed will be reported no less often than upon discharge from the reactor. If the operation of the reactor for the year long period October 1 through September 30 results in a nuclear loss of 5 kilograms or more of enriched uranium or plutonium, the quantity of material consumed must be reported on line 73 of DOE/NRC F 742 as of September 30 and no less often than annually.
  - (3) Differences between reactor-calculated quantities of material consumed and the quantities measured after dissolution will be reported on line 73.
- oo. **Line 74, NOLs/Measured Discards.** Enter known quantities of material, determined by measurement or by estimate on the basis of measurement, which have been intentionally removed from inventory and disposed of by approved methods. NOLs/measured discards result when known quantities of nuclear material are separated from a process or operation as waste during processing and are determined to be uneconomical to recover. Facilities selected under the U.S./IAEA Safeguards Agreement should see Chapter XII for additional requirements. Examples of quantities to be reported on line 74 of DOE/NRC F 742 are—
  - (1) discards to cribs, tanks, settling ponds, or waste management sites; and
  - (2) discards in contaminated equipment, laundry, or shoe covers.
- pp. **Line 75, Accidental Losses.** Enter known quantities of material, determined by measurement or by estimate on the basis of measurement to have been inadvertently lost as a result of an operational accident.
- qq. **Line 76, Approved Write-offs.** Enter known quantities of “good” materials that, with prior approval by the DOE cognizant security authority, have been removed from inventory records. Approved write-offs are usually restricted to “good” material that has been used in such a manner as to lose its identity and for which nuclear material accountability is deemed no longer necessary. If material that

was previously removed as a write-off is returned to active inventory, enter a negative quantity on line 76 to reestablish nuclear material accountability.

- rr. **Line 77, Inventory Difference.** Enter the algebraic difference between the physical inventory and its corresponding book inventory after determining that all known additions and removals have been reflected in the book inventory. Inventory difference may be either a positive or negative quantity. A gain of material is reflected by a negative inventory difference, and will be indicated by a negative (minus) sign.
- ss. **Lines 80, Ending Inventory—U.S. Government Owned.** Enter, as appropriate, the inventory as of the close of business of the last day of the reporting period. If a physical inventory is to be used as the basis for ending inventory reported on lines 80 and 81, the physical inventory must be adjusted for all additions and removals occurring between the time of the physical inventory and the close of the report period. The ending inventory entered on lines 80 and 81 must agree with the respective totals for the material type submitted to the NMMSS on DOE/NRC F 742C, Physical Inventory Listing.
- tt. **Line 81, Ending Inventory— Not U.S. Government Owned.** Enter, as appropriate, the inventory as of the close of business of the last day of the reporting period.
- uu. **Line 82, Total.** Enter total of lines 41–81. The total reported on line 82 must agree with the total reported on line 40.
- vv. **Line 83, Bias Adjustment.** Not applicable to contractors.
- ww. **Section B—Foreign Obligations.** The total amount of obligated nuclear material on hand as of the date of the report (amount on line 80 or 81 or the sum of lines 80 and 81) must be accounted for within material type, but may not exceed physical inventory. The following entries, by column, are required.
  - (1) **Block 1: Country of Obligation.** Enter the 2-character country or entity designation from Table XV-15.
  - (2) **Block 2: Element Weight.** Enter the element weight of the amount obligated from Table XV-16. The only material types to be reported are 10, 20, 50, 70, 81, and 88.
  - (3) **Block 3, Isotope Weight.** For enriched uranium (in U-235 and or U-233) only. Enter the isotope weight of the amount obligated to the nearest gram.
  - (4) **Block 4, Total Weight.** Enter the totals for columns 2 and 3. These totals represent the total obligated material at the facility.

- xx. Section C—Certification. DOE/NRC F 742 will be signed and dated by the reporting facility's authorized representative.
- yy. Distribution of DOE/NRC F 742 Data. Do not send a copy of DOE/NRC F 742 data to the NMMSS if arrangements have been made to receive a NMMSS generated MBR or if reporting electronically. If DOE/NRC F 742 is prepared in paper form, copies of each will be distributed to NMMSS and also to other recipients, if any, in accordance with instructions provided by the DOE cognizant security authority.

## CHAPTER XII - MATERIAL BALANCE REPORTING— FACILITIES SELECTED BY THE IAEA

1. INTRODUCTION. Special procedures must be used to implement some of the reporting requirements of the U.S./IAEA Safeguards Agreement. This Chapter provides instructions for use of these special procedures for facilities that have been selected under the terms of either the U.S./IAEA Safeguards Agreement or Protocol. Such facilities should note that all requirements and procedures in the main body of this Manual apply in addition to the special requirements of this Chapter.
2. PREPARATION OF DOE/NRC F 742.
  - a. DOE/NRC F 742 or its electronic equivalent will be completed by filling in the numbered blocks or lines listed in Chapter XI plus the fields that follow.
  - b. **Block 7, DOE/NRC F 740M Attached**. Place an X in the appropriate box. Concise Notes are optional unless required by facility attachments or transitional facility attachments. DOE/NRC F 740M, Concise Note, will be used by selected facilities to supplement material balance data on DOE/NRC F 742. Instructions for preparation and distribution of DOE/NRC F 740M are provided in Chapter X.
  - c. **Line 22, From Other Materials**. For each entry on this line, fill in the appropriate 2-character ICT code (see Table XV-18) in the space provided to indicate the source and destination material balances for the inventory change being reported. The IAEA does not require the reporting of category changes for enriched uranium.
  - d. **Line 30, Receipts Reported to DOE/NRC on DOE/NRC F 741**. Reporting of receipts of material for facilities selected by the IAEA may require additional procedures. Contact the Office of Resource Management for further information. (See also code 10 of the Subsidiary Arrangements to the U.S./IAEA Safeguards Agreement.)
  - e. **Line 51, Shipments Reported to DOE/NRC** (on DOE/NRC F 741 Shipments of material for facilities selected by the IAEA may require additional procedures. Contact the Office of Resource Management for further information. (See, also code 10 of the Subsidiary Arrangements to the U.S./IAEA Safeguards Agreement.
  - f. **Line 71, Degradation to Other Materials**. For each entry on this line, enter the appropriate 2-character ICT code (Degradation), as shown in Table XV-18, in the space provided to indicate the source and destination material balances for the inventory change being reported.

## CHAPTER XIII - INVENTORY REPORTING

### 1. INTRODUCTION.

- a. This Chapter provides instructions to license-exempt contractors and NRC and Agreement State licensees that are contractors for the preparation and distribution of DOE/NRC F 742C, Physical Inventory Listing.
- b. Facilities transmitting data electronically to the NMMSS do not need to complete DOE/NRC F 742C but must follow the data format defined in these instructions.
- c. Data submitted will accurately reflect data entered on the related DOE/NRC F 742C, if F 742C is prepared. If data is submitted to NMMSS electronically, do not also submit the paper form.
- d. Special instructions for facilities selected by the IAEA under the terms of the U.S./IAEA Safeguards Agreement or Protocol are provided in Chapter XIV.
- e. Inventory reports will be submitted to the NMMSS—
  - (1) By September 30 and additionally as directed by the DOE cognizant security authority; or
  - (2) as specified in facility attachment or transitional facility attachments for DOE facilities selected under the provisions of the U.S./IAEA Safeguards Agreement.
- f. Reports are due to the NMMSS operator no later than the 15<sup>th</sup> calendar day of the month following the due date of the inventory report.
- g. Nuclear material in transit at the end of a reporting period will be included in the receiver's reported inventory as if it reached the intended receiver within the reporting period (in transit rule).

### 2. NUCLEAR MATERIAL COMPOSITION CODES AND DESCRIPTIONS.

- a. Nuclear material composition codes and descriptions may be found in the inventory profile report (I-17 report from NMMSS) developed by DOE, their contractors, and NRC. The report is to be used as a guide for reporting the inventory composition code on DOE/NRC F 742C. A facility selected by the IAEA will report the IAEA material description code as appropriate.
- b. The inventory profile report (I-17) will be updated by the NMMSS operator. The report is divided into an inventory data section (lines 005–899) and a miscellaneous data section (lines 900–998). Each section is arranged according to process, usage, chemical, and physical form. The report is designed so that additional lines can be added as necessary to both the inventory data section and



the miscellaneous data section. Any proposed changes in the format are to be reported to the Office of Resource Management.

3. NUCLEAR MATERIAL TYPE CODES. Material type codes, descriptions, and reporting units are given in Table XV-2.
4. RECONCILIATION OF FACILITY DATA WITH NMMSS.
  - a. Reconciliation of facility data is required annually of facilities after submission of September 30 inventory data. The process is as follows:
    - (1) The facility submits its inventory for the period just ended and is provided with the results of processing in NMMSS.
    - (2) Preliminary reports are available upon request from the NMMSS for facility use in comparing facility data to NMMSS balances.
    - (3) The data at the facility and comparable data in the NMMSS are compared and adjustments are made to the facility books or to NMMSS, as appropriate, regarding balances of material by type, ownership code, and project number (if DOE-owned), and foreign obligation, if applicable.
  - b. Reconciliation of facility data with NMMSS more frequently than the annual periods required above is permissible.
5. PREPARATION OF DOE/NRC F 742C. The instructions that follow correspond to those data fields and columns appearing on DOE/NRC F 742C. To obtain instructions for electronic reporting, contact the NMMSS operator. Whether reporting electronically or by DOE/NRC F 742C, the following instructions apply.
  - a. **Block 1, Name and Address**. Enter reporting facility information.
  - b. **Block 2, DOE/NRC Form 740M Attached**. Check the appropriate box.
  - c. **Block 3, RIS**. Enter the RIS of the reporting facility.
  - d. **Block 4, Inventory Date**. Enter the ending date on which the MBR is based.
  - e. **Block 5, Process Code**. Leave blank.
  - f. **Block 6, Correction ID**. Leave blank.
  - g. **Block 7, License Numbers**. Leave blank.
  - h. **Block 8, Batch Data**.
    - (1) **Block 8a, Material Type**. Enter the material type code that reflects the

material assay range unless, the material is being reported under one of the following categories.

- (a) Losses—Weapons and Nonweapons [42 U.S.C. §2121(b), Material]. For material reported by assay range, use the appropriate material type code from Table XV-17.
- (b) Losses—42 U.S.C. §2121(c) Material. For material reported by assay range, use the appropriate material type code from Table XV-17.
- (c) Scrap Data (Lines 971–974). If reporting scrap generated onsite, recovered onsite, recategorized onsite, or declared to the Central Scrap Management Office, use the appropriate material type code from Table XV-17.

- (2) **Block 8b, Composition Code.** Enter the code that identifies the physical and/or chemical form of the nuclear material at the time the transaction occurs. A complete set of composition codes, which consists of available nuclear material composition codes and descriptions, may be obtained from the NMMSS operator (referred to as Composition of Ending Inventory—COEI codes).
- (3) **Block 8c, Element Weight.** Enter element weights as per the instructions in Chapter XI for DOE/NRC F 742.
- (4) **Block 8d, Isotope Weight.** Enter isotope weights as per the instructions in Chapter XI for DOE/NRC F 742.
- (5) **Block 8e, DOE Project Number.** Make no entry unless reporting DOE owned material.
- (6) **Block 8f, Scrap Program.** Leave blank.
- (7) **Block 8g, Weight percent Isotope.** Leave blank.
- (8) **Block 8h, Owner Code.** Enter the appropriate code from Table XV-3.
- (9) **Block 8i, Sequence Number.** Enter the line sequence numbers consecutively. Do not repeat or skip numbers.
- (10) **Block 8j, Batch Name.** No entry required. Can be used locally by reporting facility.
- (11) **Block 8k, Number of Items.** Leave blank.
- (12) **Block 8l, Key Measurement Point.** Leave blank.

- (13) **Block 8m, Measurement ID** (Measurement Basis, Other Measurement Point, Measurement Method). Leave blank.
  - (14) **Block 8n, Entry Status**. Leave blank.
  - (15) **Block 8o, MBA**. Leave blank.
  - (16) **Block 8p, Site/Item Description Code**. Leave blank.
  - i. **Block 9, Totals**. Enter the total inventory reported in the above categories. This total must agree with the sum of the quantities entered on Line 80 and 81 on the DOE/NRC F 742.
  - j. **Block 10, Signature**. The report, if submitted as a hard copy, will be signed by an authorized representative of the facility.
  - k. **Block 11, Title**. Enter the title of the person submitting the report.
  - l. **Block 12, Date**. Enter the date the report was submitted.
6. DISTRIBUTION OF DOE/NRC F 742C DATA. Provide the physical inventory listing to NMMSS and to others as specified by the DOE cognizant security authority.

## **CHAPTER XIV - INVENTORY REPORTING— FACILITIES SELECTED BY THE IAEA**

1. INTRODUCTION. Special procedures must be used to implement some of the reporting requirements of the U.S./IAEA Safeguards Agreement. This Chapter provides instructions for facilities that have been selected either under the terms of the U.S./IAEA Safeguards Agreement or Protocol. Such facilities should note that all requirements and procedures in the main body of this Manual apply, in addition to the special requirements of this Chapter. Refer to Chapter XIII for specific data entry instructions.
2. BATCH FORMATION AND NAMING.
  - a. The U.S./IAEA Safeguards Agreement requires inventories to be reported at the batch level of detail.
  - b. The nuclear material may be in bulk form or contained in a number of separate items. Typical batches for inventory reporting are given in facility attachments or transitional facility attachments.
  - c. In general, all of the data for one batch will be entered on one line of DOE/NRC F 742C. Material in any one batch must have only one value for the following elements:
    - (1) batch identification;
    - (2) number of items;
    - (3) inventory composition code;
    - (4) key measurement point; and
    - (5) measurement identification (i.e., measurement basis, other measurement point, and measurement method).
  - d. If a batch has more than one value for any other data element, the data should be listed on two or more lines, with all data elements completed for each line, even if this requires that some batch data be repeated.
  - e. A typical case where two lines would be required for the data on one batch would be a batch of irradiated fuel containing both uranium and plutonium. In this case, one line would be used for the uranium data, and a second for the plutonium data. The two lines should have identical entries for all data elements except for project number (if applicable), material type code, element weight, weight percent isotope, and isotope weight.

## **CHAPTER XV - NUCLEAR MATERIAL REPORTING— DATA ITEMS SUMMARY TABLES**

1. INTRODUCTION. The following are explanatory comments regarding the data item tables. This Chapter provides shorthand tables to further assist personnel in determining the information needed for nuclear material reporting.
2. DATA ITEMS EXPLANATORY NOTES.
  - a. General. The RISs used and For/To accounts are as follows.
    - (1) ANY—any RIS except DoD RISs,
    - (2) CON—any contractor RISs,
    - (3) LIC—licensee RISs,
    - (4) FOR—foreign RISs,
    - (5) CONV—contractor V RISs,
    - (6) SEP for isotopic separation facility RISs, and
    - (7) DoD for Department of Defense RISs.
  - b. For additional instructions, See Table XV-7.
3. ACCOUNTABLE QUANTITIES, MATERIAL TYPES AND OTHER INFORMATION NEEDED FOR REPORTING. Tables follow.

**Table XV-1. Nuclear Material Reporting Units and Characteristics.**

Name of Material	MT Code	Reporting Weight Unit Report to Nearest Whole Unit	Element Weight	Isotope Weight	Isotope Weight %
Depleted Uranium	10	Whole Kg	Total U	U-235	U-235
Enriched Uranium	20	Whole Gm	Total U	U-235	U-235
Plutonium-242 <sup>1</sup>	40	Whole Gm	Total Pu	Pu-242	Pu-242
Americium-241 <sup>2</sup>	44	Whole Gm	Total Am	Am-241	–
Americium-243 <sup>2</sup>	45	Whole Gm	Total Am	Am-243	–
Curium	46	Whole Gm	Total Cm	Cm-246	–
Californium	48	Whole Microgram	–	Cf-252	–
Plutonium	50	Whole Gm	Total Pu	Pu-239+Pu-241	Pu-240
Enriched Lithium	60	Whole Kg	Total Li	Li-6	Li-6
Uranium-233	70	Whole Gm	Total U	U-233	U-232 (ppm)
Normal Uranium	81	Whole Kg	Total U	–	–
Neptunium-237	82	Whole Gm	Total Np	–	–
Plutonium-238 <sup>3</sup>	83	Gm to tenth	Total Pu	Pu-238	Pu-238
Deuterium <sup>4</sup>	86	Kg to tenth	D <sub>2</sub> O	D <sub>2</sub>	
Tritium <sup>5</sup>	87	Gm to hundredth	Total H-3	–	–
Thorium	88	Whole Kg	Total Th	–	–
Uranium in Cascades <sup>6</sup>	89	Whole Gm	Total U	U-235	U-235

Report as Pu-242 if the contained Pu-242 is 20 percent or greater of total plutonium by weight; otherwise, report as Pu 239-241.

<sup>2</sup> Americium and Neptunium-237 contained in plutonium as part of the natural in-growth process are not required to be accounted for or reported until separated from the plutonium.

<sup>3</sup> Report as Pu-238 if the contained Pu-238 is 10 percent or greater of total plutonium by weight; otherwise, report as plutonium Pu 239-241.

<sup>4</sup> For deuterium in the form of heavy water, both the element and isotope weight fields will be used; otherwise, report isotope weight only.

<sup>5</sup> Tritium contained in water (H<sub>2</sub>O or D<sub>2</sub>O) used as a moderator in a nuclear reactor is not an accountable material.

<sup>6</sup> Uranium in cascades is treated as enriched uranium and should be reported as material type 89.

**Table XV-2. Nuclear Material Type Codes.**

Type Code	Type Description	Reporting Unit	Type Code	Type Description	Reporting Unit
	Uranium Depleted in U-235		44	Americium 241	gm
10	Total		45	Americium 243	gm
11	<0.21% U-235	kg	46	Curium	gm
12	0.21 to < 0.24% U-235	kg	48	Californium	microgram
13	0.24 to < 0.26% U-235	kg		Plutonium	
14	0.26 to < 0.28% U-235	kg	50	Total	gm
15	0.28 to < 0.31% U-235	kg	51	< 4.00% Pu-240	gm

**Table XV-2. Nuclear Material Type Codes (continued)**

Type Code	Type Description	Reporting Unit	Type Code	Type Description	Reporting Unit
16	0.31 to < 0.50% U-235	kg	52	4.00 < 7.00% Pu-240	gm
17	0.50 to < 0.60% U-235	kg	53	7.00 < 10.00% Pu-240	gm
18	0.60 to < 0.710% U-235	kg	54	10.00 < 13.00% Pu-240	gm
	Uranium Enriched in U-235		55	13.00 < 16.00% Pu-240	gm
20	Total		56	16.00 < 19.00% Pu-240	gm
21	> 0.712 to < 0.90% U-235	gm	57	19.00% and above Pu-240	gm
22	0.90 to < 1.15% U-235	gm		Lithium Enriched in Li-6	
23	1.15 to < 1.60% U-235	gm	60	Total	kg
24	1.60 to < 2.00% U-235	gm	61	>Normal (7.42%) to < 55.00%	kg
25	2.00 to < 2.60% U-235	gm	62	55.00 to < 80.00%	kg
26	2.60 to < 2.90% U-235	gm	63	80.00% and above	kg
27	2.90 to < 3.10% U-235	gm		Uranium Enriched in U-233	
28	3.10 to < 3.40% U-235	gm	70	Total	gm
29	3.40 to < 3.90% U-235	gm	71	< 5 ppm U-232	gm
30	3.90 to < 4.10% U-235	gm	72	5 to < 10 ppm U-232	gm
31	4.10 to < 5.00% U-235	gm	73	10 to < 50 ppm U-232	gm
32	5.00 to < 10.00% U-235	gm	74	50 ppm and above U-232	gm
33	10.00 to < 20.00% U-235	gm	81	Normal U	
34	20.00 to < 35.00% U-235	gm		Total	
35	35.00 to < 45.00% U-235	gm		0.710 to $\leq$ 0.712% U-235	kg
36	45.00 to < 80.00% U-235	gm	82	Np 237 Total	gm
37	80.00 to < 92.00% U-235	gm	83	Pu 238 Total	gm to tenth
38	92.00 to < 94.00% U-235	gm	86	D <sub>2</sub> Total	kg to tenth
39	94.00% and above U-235	gm	87	Tritium Total	gm to hundredth
	Plutonium 242		88	Thorium Total	kg
40	Total	gm	89	U in Cascades Total	gm
41	20% thru 60%	gm	90	This series is available for local use	
42	> 60%	gm			

**Table XV-3. Owner Codes.**

Owner Code	Type of Ownership of Material
G	U.S. Government owned material
J	All other non U.S. Government owned material

**Table XV-4. Half Life and Daily Decay Factors.**

Radioactive Half-life and Decay Constants				
<i>Source:</i> Brookhaven National Laboratory, National Nuclear Data Center, Nuclear Wallet Cards, 6th Edition, January 2000				
Element	Isotope	Half-Life	Standard Deviation	Daily Decay Constant (days <sup>-1</sup> )
Americium	241	432.2 y	0.700 y	0.00000439
Curium	242	162.8 d	0.200 d	0.00425766
Curium	244	18.10 y	0.020 y	0.00010485
Californium	252	2.645 y	0.008 y	0.00071749
Plutonium	238	87.7 y	0.300 y	0.00002164
Plutonium	241	14.290 y	0.006 y	0.00013280
Hydrogen (Tritium)	3	12.33 y	0.060 y	0.00015392

**Table XV-5. Decay Factors for monthly Reporting Periods. \***

			Decay Factors for months—Days in month			
Element	Isotope	Deduct From	28	29	30	31
Americium	241	E&I	0.000123	0.000127	0.000132	0.000136
Curium	242	E only	0.119215	0.123472	0.127730	0.131987
Curium	244	E only	0.002936	0.003041	0.003145	0.003250
Californium	252	I only	0.020090	0.020807	0.021525	0.022242
Plutonium	238	E&I	0.000606	0.000628	0.000649	0.000671
Plutonium	241	E&I	0.003719	0.003851	0.003984	0.004117
Hydrogen (Tritium)	3	E only	0.004310	0.004464	0.004617	0.004771

\*“E only” means that the calculated Decay Weight is to be deducted from the Element Weight. “I only” means that the calculated Decay Weight is to be deducted from the Isotope Weight. “E&I” means that the calculated Decay Weight is to be deducted from the weights of both Element and Isotope.



**Table XV-6. Decay Factors for Quarterly Reporting Periods.**

Element	Isotope	Deduct From	Decay Factors for Quarters— Days in Quarter			
			89	90	91	92
Americium	241	E&I	0.000391	0.000395	0.000399	0.000404
Curium	242	E only	0.378932	0.383189	0.387447	0.391705
Curium	244	E only	0.009332	0.009436	0.009541	0.009646
Californium	252	I only	0.063857	0.064575	0.065292	0.066010
Plutonium	238	E&I	0.001926	0.001948	0.001969	0.001991
Plutonium	241	E&I	0.011820	0.011952	0.012085	0.012218
Hydrogen (Tritium)	3	E only	0.013698	0.013852	0.014006	0.014160

For tables XV-7 and XV-8, the following notes apply. Within the tables, specific numbers are shown in parentheses to highlight some of the following notes.

- a. For those transaction types where there is a difference between shipper's and receiver's reporting requirements, an S and an R will exist in this column to reflect the differences. Only those data items that have different requirements will be separated into the S row and R row. All other common data items will exist on the row between the S and R.
- b. When to licensee, shipper RIS may be ANY, receiver RIS must be LIC. When from licensee, receiver RIS may be ANY, shipper RIS must be LIC.
- c. For and to accounts must both contain contractor RIS when owner is G, there is no change in ownership, and shipper and /or receiver have licensee or foreign RIS. RISs identify the DOE contractors having programmatic responsibility for the material before and after shipment.
- d. DoD or mutual defense side of entry is not applicable.
- e. Must contain a regular DoD RIS or a valid Q military installation RIS to reflect points of first destination for DoD receipts or pickup points for DoD returns.
- f. Required only when shipper has a licensee or foreign RIS; then it must be contractor RIS.
- g. Must be licensee RIS if shipper owner code is A or B, foreign entity RIS if shipper owner code is S.

- h. Must be licensee RIS if receiver owner code is A or B, foreign entity RIS if receiver owner code is S.
- i. For/to accounts cannot be equal.
- j. For/to accounts must be equal.
- k. Required only when receiver has a licensee or foreign RIS; then it must be contractor RIS.
- l. Appropriate licensee or foreign RIS in the account if shipper's owner code is an A, B, or S; contractor in the account if shipper's owner code is G and shipper has a licensee or foreign RIS; the field is blank otherwise.
- m. Shipper or receiver RIS must be in the V series.
- n. Appropriate licensee or foreign RIS in the account if receiver's owner code is an A, B, or S; contractor in the account if receiver's owner code is G and receiver has a licensee or foreign RIS; the field is blank otherwise.
- o. QZA, QZB, and QZD are restricted to material types 20, 40, 50, 70, and 83.
- p. If the DOD's RIS is QZE the Inventory Change code will be deemed to be either 14 or 44; if the RIS is QZC the IC code will be either 15 or 45; if the RIS is QZA, QZB, or QZD the IC code will be either 16 or 46.

**Table XV-7. Instructions for Preparation of Transaction Data Items.**

Transaction Type	S/R (1)	TI Code	S RIS	R RIS	For Account	To Account	Owner Code Required
1. DOE-owned material; transfer between contractors		Blank	CON	CON	Blank	Blank	G
2. Transfer of non-DOE owned		Blank	ANY	ANY	Blank	Blank	J
3. DOE-owned project material transfers to/from licensees (non-lease or loan)		Blank	(2)	(2)	(3)	(3)	G
4. Initiates loan/lease of DOE-owned material	S	A	ANY	ANY	(6)	LIC, FOR	G
	R	A	ANY	ANY	(6)	LIC, FOR	G
5. Transfer of leased/loaned material; change in financial responsibility		B	ANY	ANY	(7,9)	(8,9)	G,J
6. Transfer of leased/loaned material; no change in financial responsibility	S	C	ANY	ANY	(7,10)	(7,10)	G,J
	R	C	ANY	ANY	(8,10)	(8,10)	G,J
7. Leased/loaned material returned to DOE for credit	S	D	ANY	ANY	LIC, FOR	(11)	G,J
	R	D	ANY	ANY	LIC, FOR	(11)	G,J
8. Sale for account of DOE	S	E	ANY	ANY	(12)	LIC, FOR	G,J
	R	E	ANY	ANY	(12)	LIC, FOR	J
9. Enriching service procurement (feed receipt)	S	F	ANY	SEP	LIC, FOR	Blank	J
	R	F	ANY	SEP	LIC, FOR	Blank	J
10. Enriching service sale (product shipment)	S	F	SEP	ANY	Blank	LIC, FOR	J
	R	F	SEP	ANY	Blank	LIC, FOR	J
11. Procurement of privately owned material by DOE	S	G	ANY	ANY	LIC, FOR	(11)	J
	R	G	ANY	ANY	LIC, FOR		G,J
12. Donated material to others by DOE		R	(Same requirement as transaction Type 8)				
13. Donated material to DOE by others		S	(Same requirement as transaction Type 11)				
14. In-place transactions	In-place transaction should change ownership. Use data requirements of applicable transaction type as a guide. Shipper and receiver must be same RIS.						
15. In-place project transfer	Shipper and receiver must be same RIS. Use DOE Form DOE/NRC F 741.						
16. Exports; shipments to foreign countries (R RISs)	Transactions are prepared in the same manner as transfers to/from licensees except reporting entity must report both sides.						
17. Imports; receipts from foreign countries (R RISs)	Transactions are prepared in the same manner as transfers to/from licensees except reporting entity must report both sides.						
18. Inventory changes—removal		Blank	ANY	ANY	(12)	Blank	G, J
19. Inventory changes—receipt		Blank	ANY	ANY	Blank	(14)	G, J
20. Transfers involving waste facilities (V RISs)		Blank	(13)	(13)	Blank	Blank	G, J
21. Shipper or receiver adjustment	Must have an entry in correction field (block 4). Used to correct prior entries, therefore, prepare the adjusting entry using the same guidelines as the original entry for data records numbers 2 and 5, back out the original line entry in error and add the correct entry. Any of the permissible owner codes for the applicable transaction type will be accepted independently without the presence of a required owner code.						

Vertical line denotes change.

**Table XV-8. Instructions When Either the DoD or Mutual Defense Is Involved.**

	S RIS	R RIS	TI Code	Action Code	For Account	To Account	Owner Code Required
1. Transfer to DoD (4, 16)	CON	DoD (15)	Blank	A, C	Blank	(5)	G
2. Transfer from DoD (4, 16)	DoD	CON	Blank	B, D, E	(5)	Blank	G
3. Transfer from DoD (16)	DoD	DoD (16)	Blank	M	Blank	Blank	G
4. Transfer to Mutual Defense; Loan/Lease	CON	QZF or QZG	A	A, C	Shipper	Shipper	G
5. Transfer to Mutual Defense; Return of Loaned Material	CON	QZF or QZG	Blank	A, C	Receiver	Receiver	J
6. Transfer to Mutual Defense; Sale	CON	QZF or QZG	E	A,C	Blank	Receiver	G
7. Transfer from Mutual Defense; Loan of Material	QZF or QZG	CON	Blank	B, D, E	Shipper	Shipper	J
8. Transfer from Mutual Defense; Return of Loaned/Leased Material	QZF or QZG	CON	D	B, D, E	Receiver	Receiver	G
9. Transfer from Mutual Defense; Sale to DOE	QZF or QZG	CON	Blank	B, D, E	Blank	Receiver	J

**Table XV-9. Processing Code (PC).**

Processing Code (PC)	Block 5
A	Entry of new data set
C	Replacement of data set
D	Deletion of data set

**Table XV-10. Action Code (AC).**

Action Code (AC)	Block 6
A	Shipper's original data
B	Receiver's data accepting shipper's weights without measurement
C	Shipper's adjustment or acknowledgment
D	Receiver's adjustment or acknowledgment
E	Receiver's independent measurement or determination
J <sup>1</sup>	Receiver's interim data reporting material in transit or project receipts
M	One-party transaction
N <sup>2</sup>	Known delay in receiver reporting of at least 10 days but less than 30 days
P	In-place transfers between projects
R	Identifies a one-party transaction to remove the WR obligation on material.
S <sup>3</sup>	Receiver's data accepting shipper's weights under a safeguards closure
T	Contested weights
U <sup>4</sup>	Known delay in receiver reporting of at least 30 days
X	Shipper's side of an obligation exchange
Y	Receiver's side of an obligation exchange

Action code J identifies receiver's interim reporting of project receipt of DOE production or research materials that are in transit at the end of the month or that have been received but not reported. A transaction with action code J must be followed with action code B, E, or S.

<sup>2</sup>A transaction with action code N must be followed with action code B, E, or S. Note: NRC defines action code N differently from DOE, and NRC does not use action code S.

<sup>3</sup>Safeguards closure only for certain facilities. Restricted to DOE sites, owner code G, shipper and receiver can't be the same, TI is blank, can't use with a V RIS, and detail lines are reported.

<sup>4</sup>A transaction with action code U must be followed with action code B, E, or S.

**Table XV-11. Nature of Transaction Indicator (TI) Code.**

Nature of Transaction Code (TI)	Block 11
A	Initiates loan/lease
B	Transfers loan/lease
C	Transfer of leased/loaned material with no change in loan/lease responsibility
D	Return of leased/loaned material to DOE for credit
E	Sale for DOE
F	Pursuant to an enriching service agreement
G	Sale to DOE
R	Transfer from Government to private inventory other than by sale or enriching service agreement
S	Transfer from private to Government inventory other than by sale or enriching service agreement

**Table XV-12. Inventory Change Code—Receipts.**

<b>Inventory Change Code</b>	<b>Blocks 26c and 27c Other Receipts</b>
11	Procurement from DOE
13	Purchase Procurement—For Account of DOE
14	DoD Returns—Use A
15	DoD Returns—Use B
16	DoD Returns—Other Uses
21	Production
22	From Other Materials
30	Receipts reported to DOE/NRC on DOE/NRC F 741 (not listed elsewhere)
34	Receipts—Miscellaneous
37	Procurement by Others
38	Donated Material—from DOE to Others
39	Donated Material—from Others to DOE

**Table XV-13. Inventory Change Code—Removals.**

<b>Inventory Change Code</b>	<b>Blocks 26c and 27c Other Removals</b>
41	Expended in Space Programs
42	Sales to DOE
43	Sales to Others for the Account of DOE
44	DoD—Use A
45	DoD—Use B
46	DoD—Other Uses
47	Expended by DOE Tests
48	Routine Tests
51	Shipments reported to DOE/NRC on DOE/NRC F 741 (not listed elsewhere)
54	Shipments - Miscellaneous
58	Donated Material—to DOE by Others
59	Donated Material—to Others by DOE
65	Rounding Bias (used for A-M transactions)
71	Degradation to Other Materials
72	Decay
73	Fission and Transmutation
74	Normal Operational Losses/Measured Discards
75	Accidental Losses
76	Approved Write-offs
77	Inventory Differences

**Table XV-14 Material Type Codes and IAEA Element Codes—Import Export.**

Description	U.S. Material Type Code	IAEA Element Code
Depleted Uranium	10	D
Enriched Uranium	20	EG
Plutonium	50	P
Normal Uranium	81	N
Thorium	88	T
All Others	(All Other Codes)	(Blank)

**Table XV-15. Foreign Obligation Codes.**

Country/Entity	Obligation Codes*
31	Australia
32	Canada
33	EURATOM
34	Japan
35	Peoples Republic of China
36	Czech Republic
91	Australia and EURATOM
92	Canada and EURATOM
WR	Former Soviet Union Weapons

\*NOTE: For any other obligation codes not included above, contact the NMMSS Operator for further instructions.

**Table XV-16. Material Type Codes, IAEA Element Codes, and Quantities for Source and SNM—Obligations Tracking.**

Type	Domestic Code	IAEA Code	Reportable Obligated Quantity*
Natural Uranium	MT 81	N	Kilogram Uranium
Depleted Uranium	MT 10	D	Kilogram Uranium
Thorium	MT 88	T	Kilogram Thorium
Plutonium	MT 50	P	Gram Plutonium
High Enriched Uranium	MT 20 $\geq$ 20%	EG	Gram Total Uranium for Element Gram U-235 for Isotope
Low Enriched Uranium	MT 20 < 20%	EG	Gram Total Uranium for Element Gram U-235 for Isotope
Uranium-233	MT 70	EK	Gram Total Uranium for Element Gram U-233 for Isotope

\*For foreign obligations tracking, only the element weight is required except for uranium enriched in U-235 or U-233.

**Table XV-17. Material Type Codes Used For Specific Circumstances.**

	Name of Material	Material Type Code
Losses—Weapons and Nonweapons (See 42 U.S.C. §2121(b) Material)	Uranium-Depleted in U-235	11
	Uranium-Enriched in U-235	21
	Plutonium	51
	Lithium-Enriched in Li-6	61
	Uranium-Enriched in U-233	71
Losses (See 42 U.S.C. §2121(c) Material)	Uranium-Depleted in U-235	11
	Uranium-Enriched in U-235	21
	Plutonium	51
	Lithium-Enriched in Li-6	61
	Uranium-Enriched in U-233	71
Scrap Data	Uranium-Depleted in U-235	10
	> 0.711% to < 10.00%	21
	10.00% and above	33
	Plutonium	51
Total—Inventory Data	Uranium-Depleted in U-235	10
	Uranium-Enriched in U-235	20
	Plutonium-242	40
	Plutonium	50
	Lithium-Enriched in Li-6	60
	Uranium-Enriched in U-233	70

**Table XV-18. Inventory Change Type (ICT) Codes—IAEA.**

ICT Code	From Balance	To Balance
DN	Depleted Uranium	Normal Uranium
DE	Depleted Uranium	Enriched Uranium
ND	Normal Uranium	Depleted Uranium
NE	Normal Uranium	Enriched Uranium
ED	Enriched Uranium	Depleted Uranium
EN	Enriched Uranium	Normal Uranium



**Table XV-19. DOE Contractor Reporting Procedure for  
Normal Operational Losses/Measured Discards and Accidental Losses.**

Types of Transactions Shipper (S) Receiver (R)		Action Code S R		Applicable to (Type of Facility)	Description from Viewpoint Of the Facility	Inventory Change Code (use code) S R		Project Number S R		Data Generated By NMMSS
Facility RIS with H, I, L appended	Facility RIS with H, I, L appended	M (one single party entry)		1. Non-Lic DOE contr. (non-IAEA) 2. FAC under IAEA 3. Lic contr.	Material written off to reflect internal changes to waste disposition areas inventory— removed from facility's inventory	Single entry: 65, 72, 76, 77		Single entry: not required		None
Facility is same as Receiver	Facility is same as Shipper	M (one single party entry)		1. Non-Lic DOE contr. (non-IAEA)	NOL/MD/AL not to atmosphere, or ground and not coincident with transfer to burial site—removed from facility's inventory	Single entry: 74, 75 or 48		Single entry: req. if G owner code		None
Facility RIS	Facility RIS with A, G, R appended (same site as Shipper)	A	N/A	1. Non-lic DOE contr. (non-IAEA) 2. Fac under IAEA 3. Lic contr.	NOL/MD/AL <sup>1</sup> to atmosphere, ground, or consumed in research—removed from shipper's inventory	74, 75 or 48	N/A	Req. for owner code G	N/A	Receiver
Facility RIS	Facility RIS with H, I, L appended (same site as Shipper)	A	N/A	1. Fac. under IAEA 2. Lic. contr. 3. See note <sup>3</sup>	NOL/MD/AL <sup>1</sup> to a retained waste holding area—removed from shipper's inventory	74, 75	N/A	Req. for owner code G	N/A	Receiver when type fac = 1 or 2 None when type fac = 3
Facility RIS	VVV	A	B/E	1. Non-Lic. DOE contractor 2. Facility under IAEA 3. Licensed contractor	NOL/MD/AL <sup>1</sup> removed from shipper's inventory coincident with the removal to a burial site	74, 75 or 48	not req. (leave blank)	Req. for owner code G	not req. (leave blank)	None
FAC > VVV		A	B/E <sup>2</sup>	1. Non-Lic. DOE contractor non-IAEA)	Transfer of material to burial site where material previously removed from shipper's inventory by M transaction— no effect to shipper's records	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	None
Facility RIS with H or L appended	VVV	A	B/E <sup>2</sup>	1. Fac. under IAEA 2. Lic. contr. 3. See footnote	Transfer of material from a retained waste holding area to the burial site	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	None

Table XV-19. (continued)

Types of Transactions Shipper (S)	Receiver (R)	Action Code		Applicable to (Type of Facility)	Description from Viewpoint Of the Facility	Inventory Change Code (use code)		Project Number		Data Generated By NMMSS
		S	R			S	R	S	R	
Facility RIS with I or G appended	VVV	A	B/E <sup>2</sup>	1. Non-Lic. DOE contr. (non-IAEA) 2. Fac. under IAEA 3. Lic. contr.	Material previously written off as discarded to the ground now being recovered and transferred to a burial site	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	None
Facility RIS with I or G appended	VVV	A	B/E <sup>2</sup>	1. Non-Lic. DOE contr. (non-IAEA) 2. Fac. under IAEA 3. Lic. contr.	Material previously written off as discarded to the ground now being recovered and transferred to a burial site	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	None
Facility RIS with H, I, L appended	Facility RIS (same site as,Shipper)	N/A	B/E <sup>2</sup>	1. Fac. under IAEA 2. Lic. contr. 3. See footnote 3	Transfer of material from a retained waste holding area back to facility's inventory	N/A	N/A	N/A	req. if G owner code	Shipper when type fac = 1 or 2 None when type fac = 3
VVV	Facility RIS	A <sup>2</sup>	B/E	1. Non-Lic. DOE contr. (non IAEA) 2. Fac. under IAEA 3. Lic. contr.	Material being retrieved from a burial site for some specific use—increases receiver's inventory	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	req. if G owner code	None
VVV	Facility RIS	A <sup>2</sup>	B/E	1. Non-Lic. DOE contr. (non IAEA)	Material previously written off as NOL/MD/AL and transferred to a burial site—now being returned to the facility—NOL REVERSAL	not req. (leave blank)	74, 75 or 48	not req. (leave blank)	req. if G owner code	None
VVV	Facility RIS with A, G, I appended	A <sup>2</sup>	B/E	Burial site shipping is specifically identified contractor's waste disposition area	Material previously written off as NOL/MD/AL <sup>1</sup> and transferred to a burial site— now being dissipated to atmosphere or ground or transferred to an incinerator from burial site—not to be treated as NOL/MD/AL <sup>1</sup>	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	not req. (leave blank)	None

<sup>1</sup>NOL/MD/AL—Normal Operational Loss/Measured Discard/Accidental Loss

<sup>2</sup>For DOE burial site, applicable shipper or receiver data is not reported to NMMSS

<sup>3</sup>Reporting under this method is optional for non-licensed DOE contractors not under IAEA reporting requirements

FAC = DOE contractor facility, VVV = Burial Site

Facility fourth character indicates a discharge to: A = atmosphere, G = ground, H = on-site waste holding area, I = toxic substance control act incinerator, L = lagoon, tank or holding pond, R = consumed in research

NOTE: All other data elements are the same as normal requirements.

## **CHAPTER XVI - ACRONYMS AND ABBREVIATIONS**

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
COEI	Composition of Ending Inventory
CRD	Contractor Requirements Document
DoD	Department of Defense
DOE	Department of Energy
FOIA	Freedom of Information Act
IAEA	International Atomic Energy Agency
ICT	inventory change type
ID	inventory difference
INMTS	International Nuclear Materials Tracking System
MBA	material balance area
MBR	material balance report
MC&A	materials control and accountability
MT	material type
NDA	nondestructive assay
NMR	nuclear materials representative
NMMSS	Nuclear Materials Management Safeguards System
NNSA	National Nuclear Security Administration
NOL	normal operational loss
NRC	Nuclear Regulatory Commission
PC	processing code
RIS	reporting identification symbol
SED	shipper's export declaration
SIMEX	Secure Information Management and Exchange Network
SNM	special nuclear materials
TI	transaction indicator
U.S.C.	United States Code

## **CHAPTER XVII - FORMS**

The following images are examples of the paper forms that can be used for data submission to the NMMSS. However, electronic submission of data is the required method unless manual submission is coordinated with the DOE cognizant security authority. The forms are for illustrative and instructional purposes. Do not print out these forms and use them to submit data to NMMSS. The correct copies of the forms to use to submit data to the NMMSS are available for download in portable document format (PDF) from the NMMSS operator or from <http://directivesdoe.gov/forms/index.htm>.

DOE M 470.4-6  
8-26-05

[illegible]

DOENRC FORM 741  
(5-2002) Previous editions are obsolete  
MANDATORY DATA COLLECTION  
AUTHORIZED BY 10 CFR 30.40, 50, 70, 72, 74, 75, 150,  
Public Laws 83-703, 93-438, 95-91

U.S. DEPARTMENT OF ENERGY  
AND  
U.S. NUCLEAR REGULATORY COMMISSION

NUCLEAR MATERIAL TRANSACTION REPORT

APPROVED BY OMB: NO. 3150-0003  
Expires: 05/31/2005  
Estimated burden per response to comply with this mandatory collection request: 45 minutes. This information is required for IAEA accounting reports that show changes in inventory of nuclear materials. Send comments regarding burden estimate to the Records Management Branch (1-6 E5), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to info@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOH-10202, (3150-0003), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. SHIPPER'S RS  
a. NAME AND ADDRESS OF SHIPPER  
b. LICENSE NO.

2. RECEIVER'S RS  
a. NAME AND ADDRESS OF RECEIVER  
b. LICENSE NO.

3. TRANSACTION NO.

4. CORRECTION NO.

5. SHIPPER  
a. SHIPPER  
b. RECEIVER

6. PROCESSING CODE

7. ACTION CODE

8. DOCUMENTATION (Only if document is classified SECRET)

9. ATTENTION:  
4. TELEPHONE:

14. TRANSFER AUTHORITY- CONTRACT, NM DRAFT, OR ORDER NUMBER

16. MATERIAL TYPE AND DESCRIPTION

11. NATURE OF TRANSACTION  
13a. SHIPPED TO ACCOUNT OF  
b. RS

12a. SHIPPED FOR ACCOUNT OF  
b. RS

15. EXPORT OR IMPORT TRANSFER: LICENSE NO.

17. DELIVERY DATE  
21. DELIVERY DATE FOR ENCLOSED MATERIAL ONLY

22. ACTION DATE  
a. SHIPMENT  
b. SHIPPER'S CORRECTION  
c. RECEIPT  
d. RECEIVER'S MEASUREMENT  
e. RECEIVER'S CORRECTION

23a. MISCELLANEOUS  
b. CONCISE NOTE ATTACHED  
c. UN-REPORTABLE?

24. TOTAL GROSS WEIGHT  
a. OVERALL GROSS WEIGHT  
b. BASIS  
c. GROSS WEIGHT  
d. NET WEIGHT  
e. GROSS WEIGHT  
f. NET WEIGHT  
g. GROSS WEIGHT  
h. NET WEIGHT  
i. GROSS WEIGHT  
j. NET WEIGHT  
k. GROSS WEIGHT  
l. NET WEIGHT  
m. GROSS WEIGHT  
n. NET WEIGHT  
o. GROSS WEIGHT  
p. NET WEIGHT  
q. GROSS WEIGHT  
r. NET WEIGHT

25. TOTAL VOLUME (Measure Transfers Only)

26. SHIPPER'S DATA  
a. BOX NO.  
b. TYPE OF CHANGE  
c. IDENTIFICATION (ITEM/DATE)  
d. NO. OF ITEMS  
e. PROJECT NUMBER  
f. DATE-TYPE  
g. DATE-TYPE  
h. DATE-TYPE  
i. DATE-TYPE  
j. DATE-TYPE  
k. DATE-TYPE  
l. DATE-TYPE  
m. DATE-TYPE  
n. DATE-TYPE  
o. DATE-TYPE  
p. DATE-TYPE  
q. DATE-TYPE  
r. DATE-TYPE

27. RECEIVER'S DATA  
a. DATE-TYPE  
b. DATE-TYPE  
c. DATE-TYPE  
d. DATE-TYPE  
e. DATE-TYPE  
f. DATE-TYPE  
g. DATE-TYPE  
h. DATE-TYPE  
i. DATE-TYPE  
j. DATE-TYPE  
k. DATE-TYPE  
l. DATE-TYPE  
m. DATE-TYPE  
n. DATE-TYPE  
o. DATE-TYPE  
p. DATE-TYPE  
q. DATE-TYPE  
r. DATE-TYPE

26s. SHIPPER'S DATA  
SIGNATURE OF AUTHORIZED OFFICIAL AND DATES SIGNED

27s. RECEIVER'S DATA  
SIGNATURE OF AUTHORIZED OFFICIAL AND DATES SIGNED

WARNING: FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECTS. 18 U.S.C. SECTION 1001 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

Section B  
XVII-4

DOE M 470.4-6  
8-26-05

<b>DOE/NRC FORM 742</b> <b>U.S. DEPARTMENT OF ENERGY</b> (8-2000) MANDATORY DATA COLLECTION AUTHORIZED BY 10 CFR 30, 40, 50, 70, 72, 74, 75, 150, Public Laws 83-703, 93-438, 95-91  <b>U.S. NUCLEAR REGULATORY COMMISSION</b>  <b>MATERIAL BALANCE REPORT</b>		<b>APPROVED BY OMB: NO. 3150-0004</b> <b>EXPIRES: 08/31/2003</b>  Estimated burden per response to comply with this mandatory collection request: 45 minutes. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to <a href="mailto:infocollects@nrc.gov">infocollects@nrc.gov</a> , and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0000), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.	
1. NAME AND ADDRESS		2. LICENSE NUMBER(S)	3. REPORTING IDENTIFICATION SYMBOL (RIS)
6a. PROCESS CODE	6b. CORRECTION IDENTIFICATION	4. REPORT PERIOD (MM/DD/YYYY) FROM      TO	5. MATERIAL TYPE (Submit separate report for each type)

  

<b>SECTION A</b>		<b>MATERIAL ACCOUNTABILITY</b>	
7. DOE/NRC 740M ATTACHED <input type="checkbox"/> YES <input type="checkbox"/> NO	A. ELEMENT WEIGHT	B. ISOTOPE WEIGHT	
8. BEGINNING INVENTORY -- U.S. GOVT-OWNED			
9. BEGINNING INVENTORY -- NOT U.S. GOVT-OWNED			
11. PROCUREMENT FROM DOE      RECEIPTS			
FROM:      RIS			
_____			
13. PROCUREMENT -- FOR THE ACCOUNT OF DOE			
14. DOD RETURNS -- USE A			
15. DOD RETURNS -- USE B			
16. DOD RETURNS -- OTHER USES			
21. PRODUCTION			
22. FROM OTHER MATERIALS      a. ICT			
_____      b. ICT			
_____      c. ICT			
30. RECEIPTS REPORTED TO DOE/NRC ON DOE/NRC 741 (not listed elsewhere)			
FROM:      RIS			
_____			
_____			
34. RECEIPTS -- MISC			
37. PROCUREMENT BY OTHERS			
38. DONATED MATERIAL -- FROM U.S. GOVT TO OTHERS			
39. DONATED MATERIAL -- FROM OTHERS TO U.S. GOVT			
40. TOTAL (Lines 8-39)			
_____      REMOVALS			
41. EXPENDED IN SPACE PROGRAMS			
42. SALES TO U.S. GOVT RIS TO:      RIS			
TO:      _____			
43. SALES TO OTHERS FOR THE ACCOUNT OF U.S. GOVT      RIS			
TO:      _____			
44. DOD -- USE A			
45. DOD -- USE B			
46. DOD -- OTHER USES			
47. EXPENDED IN U.S. GOVT TESTS			
48. ROUTINE TESTS			
49. SHIPPER -- RECEIVER DIFFERENCE			
51. SHIPMENTS REPORTED TO NRC/DOE ON DOE/NRC 741 (not listed elsewhere)			
TO:      RIS			
_____			
_____			

<b>SECTION A (Continued)</b>		<b>MATERIAL ACCOUNTABILITY</b>	
		<b>A. ELEMENT WEIGHT</b>	<b>B. ISOTOPE WEIGHT</b>
54. SHIPMENTS -- MISC			
58. DONATED MATERIAL -- TO U.S. GOVT BY OTHERS			
59. DONATED MATERIAL -- TO OTHERS BY U.S. GOVT			
65. ROUNDING BIAS			
71. DEGRADATION TO OTHER MATERIALS    a. ICT			
b. ICT			
72. DECAY			
73. FISSION AND TRANSMUTATION			
74. NORMAL OPERATIONAL LOSSES/MEASURED DISCARDS			
75. ACCIDENTAL LOSSES			
76. APPROVED WRITE-OFFS			
77. INVENTORY DIFFERENCE			
80. ENDING INVENTORY -- U.S. GOVT OWNED			
81. ENDING INVENTORY -- NOT U.S. GOVT OWNED			
<b>82. TOTAL (lines 41-81)</b>			
83. BIAS ADJUSTMENT			

  

<b>SECTION B</b>		<b>FOREIGN OBLIGATIONS</b>	
<b>1. COUNTRY OF OBLIGATION</b>	<b>2. ELEMENT WEIGHT</b>	<b>3. ISOTOPE WEIGHT</b>	
<b>4. TOTAL WEIGHT</b>			

  

<b>SECTION C</b>		<b>CERTIFICATION</b>	
To the best of my knowledge and belief, the information given above and in any attached schedules is true, complete, and correct.			
SIGNATURE ( <i>See instructions for provisions on confidentiality</i> )	TITLE	DATE	
<b>WARNING:</b> FALSE STATEMENTS IN THIS CERTIFICATE MAY BE SUBJECT TO CIVIL, AND/OR CRIMINAL PENALTIES. NRC REGULATIONS REQUIRE THAT SUBMISSIONS TO THE NRC BE COMPLETE AND ACCURATE IN ALL MATERIAL RESPECTS. 18 U.S.C. SECTION 1001 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.			



[illegible]

OMB Control No.  
1910-1800

PAGE \_\_\_\_\_

DATE \_\_\_\_\_

**U.S. DEPARTMENT OF ENERGY**  
**ADP TRANSCRIPTION SHEET**  
**INTERNAL PROJECT TRANSFERS**  
(See instructions for provisions regarding confidentiality.)

[illegible]

18 U.S.C. SECTION 1001; ACT OF JUNE 25, 1948; 62 STAT. 749; MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

**ATTACHMENT 1**  
**DEPARTMENTAL ELEMENTS TO WHICH**  
**DOE M 470.4-6 APPLIES**

Office of the Secretary

| Office of Chief Financial Officer

Office of Chief Information Officer

Office of Civilian Radioactive Waste Management

Office of Counterintelligence

Office of Energy Efficiency and Renewable Energy

Office of Environment, Safety and Health

Office of Environmental Management

Office of Fossil Energy

Office of Policy and International Affairs

Office of Security and Safety Performance Assurance

Office of the Inspector General

| Office of Intelligence and Counterintelligence

National Nuclear Security Administration

Office of Nuclear Energy

Office of Science

## ATTACHMENT 2

### CONTRACTOR REQUIREMENTS DOCUMENT

Regardless of the performer of the work, the contractor is responsible for compliance with the requirements of this Contractor Requirements Document (CRD). The contractor is responsible for flowing down the requirements of this CRD to subcontracts at any tier to the extent necessary to ensure the contractor's compliance. In doing so, the contractor will neither unnecessarily nor imprudently flow down requirements to subcontracts.

A violation of the provisions of this directive relating to the safeguarding or security of Restricted Data or other classified information may result in a civil penalty pursuant to subsection a. of section 234B. of the Atomic Energy Act of 1954 (42 U.S.C. 2282b.). The procedures for the assessment of civil penalties are set forth in Title 10, Code of Federal Regulations, Part 824, "Procedural Rules for the Assessment of Civil Penalties for Classified Information Security Violations," (10 CFR part 824.)

This CRD consists of Section A and B of the preceding Manual, DOE M 470.4-6, *Nuclear Material Control and Accountability*, with the exception of the following paragraphs that only apply to DOE elements.

Section A, Chapter I, paragraph 1f

Section A, Chapter I, paragraph 5b

Section A, Chapter I, paragraph 6d

Section B, paragraph 3c

Section B, Chapter I, paragraph 1b

Section B, Chapter III, paragraph 15a

Section B, Chapter IV, paragraph 1o(2)(e)

Section B, Chapter VI, paragraph 1c(2)(a)-(h)

Section B, Chapter VI, paragraph 3a.-c

The following paragraphs should be substituted for designated sub-sections as they only apply to DOE contractors.

Section A, Chapter II, paragraph 5a(5)

The contractor must submit request for acceptance of SNM in foreign reactor fuel without measurement through DOE line management to be approved by the Under Secretary and or his/her designee.

Additionally, where DOE M 470.4-6, *Nuclear Material Control and Accountability*, requires the DOE cognizant security authority or DOE line management to approve a plan, procedure, or requirement, the contractor shall submit the plan, procedure, or requirement to the DOE cognizant security authority or DOE line management for approval in a timely manner and shall not operate under the plan, procedure, or requirement until it has been approved by the DOE cognizant security authority or DOE line management, whichever approval is applicable. Where DOE M 470.4-6, *Nuclear Material Control and Accountability*, requires the DOE cognizant security authority or DOE line management to establish materials control and accountability requirements, the contractor will follow the requirements established by the DOE cognizant security authority or DOE line management.

Approved: 8-26-05  
Chg 1: 8-14-06

**SUBJECT: NUCLEAR MATERIAL CONTROL AND ACCOUNTABILITY PROGRAM**

---

1. PURPOSE. To transmit revised pages to DOE M 470.4-6, *Nuclear Material Control and Accountability*, dated 8-26-05.
2. EXPLANATION OF CHANGES. The page changes (1) add a requirement that DOE offices responsible for nuclear materials at NRC licensees validate that the licensees continue to possess the materials and have a continuing need for them, (2) eliminate the requirement for inventory confirmation measurements of tamper-indicating items provided the items are under a material surveillance program, and (3) simplify requirements for reporting to the Nuclear Materials Management and Safeguards System (NMMSS) and update the Manual to reflect the Office of Resource Management as the program office for NMMSS within the Office of Security and Safety Performance Assurance.
3. LOCATIONS OF CHANGES.

<u>Pages</u>	<u>Paragraphs</u>
ii	5c(1)-(3)
iii	5c(4)
vii	Table III-2
Section A	
I-2	Table I-1
I-5	Table I-2
I-8	2b
I-9	3
I-11	Table I-5
I-11	3a(1)
I-12	3c(4) and 4b
I-15	4c(6)
I-17	6d(1)-(2)
I-18	6d(2)
II-6	Table II-2
II-6	3d(1)

## Section A (continued)

II-13	5a(4)(a)
II-14	Table II-4
II-15	5a(4)(e)-(f)
III-1	3
III-3	3b(1)(a) and 3b(3)
III-5	5a

## Section B

1	1g(2)
3	7 and 8
I-1	2a(3) and 2a(4)
I-2	2c
I-4	4d and 4e
I-5	5b
II-3	6b
III-2	1e(3) and Table III-1
III-4	Table III-2
III-7	11a(5)(d) and (f)
III-8	13a
IV-7	1o(3)
IV-8	1z(1)(c) and (d)
IV-9	1z(3)
IV-12	1z(19) and 1aa
V-2	1e(1)
VI-2	1c(2)(a)
VII-1	2a and 2b, 3a, 3b(1)-(4)
VII-2	3c(1)-(4)
VII-5	6c and 6d
VII-7	7a
IX-2	2g
XI-1	1d(1)
XII-1	2d and 2e

Section B (continued)

XIII-1	1e(1) and 2b
XIII-2	4a(3)
XIII-3	5h (2)
XV-4	Table XV-4 and Table XV-5
XV-5	Table XV-6
XV-7	Table XV-7
XV-8	Table XV-8

Att 1, Page 1

Att 2, Page 1

After filing the attached pages, this transmittal may be discarded.



SAMUEL W. BODMAN  
Secretary