

NOTE

DOE 5633.3B, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIAL, CONSOLIDATES EXISTING ELEMENTS OF FOUR ORDERS (DOE 5633.2A, DOE 5633.3A, DOE 5633.4, AND 5633.5), WHICH ELIMINATES DUPLICATION, CONFLICTS, AND UNNECESSARY/BURDENSOME REQUIREMENTS. THE ONLY SUBSTANTIVE CHANGE IN REQUIREMENTS CONCERNS PHYSICAL INVENTORY. THE INITIATING ORGANIZATION COORDINATED THESE CHANGES WITH SELECTED OFFICIALS. SHOULD YOU HAVE ADDITIONAL SUBSTANTIVE CONCERNS, PLEASE ADDRESS ANY COMMENTS TO THE CHIEF, MATERIALS CONTROL AND ACCOUNTABILITY BRANCH, ROOM E-381, GERMANTOWN.

**U.S. Department of Energy**  
**Washington, D.C.**

**ORDER**

DOE 5633.3B

9-7-94

SUBJECT: CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS

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1. PURPOSE. To prescribe the Department of Energy (DOE) minimum requirements and procedures for control and accountability of nuclear materials at DOE-owned and -leased facilities and DOE-owned nuclear materials at other facilities which are exempt from licensing by the Nuclear Regulatory Commission.
  2. CANCELLATIONS.
    - a. DOE 5633.2A, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS: RESPONSIBILITIES AND AUTHORITIES, of 9-23-92.
    - b. DOE 5633.3A, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, of 2-12-93.
    - c. DOE 5633.4, NUCLEAR MATERIALS TRANSACTIONS: DOCUMENTATION AND REPORTING, of 2-9-88.
    - d. DOE 5633.5, NUCLEAR MATERIALS REPORTING AND DATA SUBMISSION PROCEDURES, of 5-22-87.
  3. APPLICABILITY/EXCLUSIONS/DEVIATIONS.
    - a. General. This Order applies to nuclear materials at Department of Energy-owned and -leased facilities and DOE-owned nuclear material at other facilities which are exempt from licensing by the Nuclear Regulatory Commission.
    - b. Application to Contracts. Except for the exclusions in paragraph 3c, the provisions of this Order are to be applied to covered contractors and they will apply to the extent implemented under a contract or other agreement. A covered contractor is a seller of supplies or services that is awarded a procurement contract or subcontract and either possesses, uses, or ships nuclear materials at DOE-owned or -leased facilities; or possesses, ships, or uses DOE-owned nuclear material at an offsite facility exempt from Nuclear Regulatory Commission licensing and regulation.
    - c. Exclusions. This Order does not apply to DOE-owned nuclear materials at Department of Defense facilities or foreign facilities. To avoid duplicative or conflicting requirements, DOE facilities, projects, and programs under the cognizance of the Office of Civilian Radioactive Waste Management and subject to Nuclear Regulatory Commission regulation shall use the rules, standards, and criteria specified by the Nuclear Regulatory Commission or Nuclear Regulatory Commission Agreement State in lieu of this Order.

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INITIATED BY:

Office of Safeguards  
and Security

d. Deviations. Deviations from the requirements prescribed by this Order shall be processed in accordance with DOE 5630.1-16, SAFEGUARDS AND SECURITY PROGRAM.

4. REFERENCES AND DEFINITIONS. See Attachment 1 for references. Definitions of commonly-used terms are provided in the "Safeguards and Security Definitions Guide," which is maintained by the Office of Safeguards and Security.

5. POLICY. The nuclear materials subject to this Order shall be controlled and accounted for in a graded manner consistent with the design basis threat and with their strategic and monetary importance. Where applicable, the site-specific safeguards and security planning document will contain the design basis threat requirements which may reflect some modifications to meet site-specific needs. Material control and accountability systems will provide accurate nuclear materials inventory information; control nuclear materials in order to deter and prevent loss or misuse; provide timely and localized detection of unauthorized removals of nuclear materials within specified limits; provide assurance that all nuclear materials are accounted for and that theft/diversion has not occurred; and assist in the prevention of radiological and/or toxicological sabotage involving nuclear materials that could adversely impact national security, the health and safety of employees, the public, or the environment. In addition, DOE will:

- a. Assure that material control and material accountability measures are designed to facilitate, to the extent practical, cost effective integration of the operational mission of the program with environmental, health, and safety, and physical protection considerations.
- b. Provide accountability and control data on a timely and uniform basis for nuclear material safeguards and nuclear materials management.
- c. Assure that nuclear materials or equipment supplied to nations or persons abroad are subject to measures designed to assure that they are used for official purposes only, pursuant to an agreement for cooperation or other understanding with the United States.
- d. Facilitate the development and implementation of foreign country and International Atomic Energy Agency safeguards systems.

6. RESPONSIBILITIES AND AUTHORITIES.

a. Heads of Headquarters Elements shall:

- (1) Provide oversight for the implementation of material control and accountability of nuclear materials for all DOE activities under their jurisdiction in conformity with the policies, procedures, planning, and other requirements set forth in the DOE 5630 series of directives, and set policies, procedures, and requirements for nuclear materials not specifically covered in the DOE 5630 series.
- (2) Ensure that responsibilities and authorities for materials control and accountability of nuclear materials are addressed in the Memorandums of

Agreement and associated appendices between Heads of Headquarters Elements and Managers of Operations Offices.

- (3) For matters under their cognizance, ensure that self-assessment offices conduct independent assessments of the adequacy of DOE and contractor performance of their responsibilities for material control and accountability of nuclear materials.
  - (4) For matters under their cognizance, ensure an individual(s) is (are) designated to be responsible for bringing to the attention of the contracting officer each procurement falling within the scope of this Order. Unless another individual is designated, the responsibility is that of the procurement request originator (the individual responsible for initiating a requirement on DOE F 4200.33, "Procurement Request Authorization").
  - (5) Through contracting officers require that:
    - (a) Each contractor and subcontractor under their jurisdiction who may use or possess nuclear materials as identified in Figure I-1, page I-2, is required by contract to develop and maintain current written procedures for safeguards control and accountability of nuclear materials.
    - (b) Each contract under which nuclear materials are to be supplied contains appropriate safeguards provisions consistent with DOE policy.
    - (c) Inventory and scrap levels of nuclear materials held by contractors and subcontractors under their jurisdiction are minimized to be consistent with operational needs and good safeguards practices.
  - (6) Ensure material control and accountability requirements are considered in all phases of design of new facilities/operations under their cognizance.
  - (7) Ensure appropriate actions are taken to correct safeguards deficiencies at facilities under their cognizance.
- b. Director of Nonproliferation and National Security through the Director of Security Affairs shall:
- (1) Establish DOE-wide policies, procedures, and standards for the material control and accountability of special nuclear material and other designated nuclear materials.
  - (2) Submit reports to the Secretary on the status of the safeguards program in conjunction with the Annual Report to the President on the Status of Safeguards and Security of Domestic Nuclear Weapons Facilities.

c. Director of Safeguards and Security shall:

- (1) Develop, after coordination with appropriate Departmental elements, DOE-wide policies, procedures, and standards, and provide staff guidance for the safeguarding of nuclear materials.
  - (a) Develop and establish policies, procedures, and standards concerning the documentation of nuclear materials transactions, inventories, and material balances affecting DOE Headquarters and field elements, contractors, and subcontractors.
  - (b) Develop and establish policies, procedures, and standards for the submission of information on nuclear materials transactions, inventories, and material balances to the Nuclear Materials Management and Safeguards System.
  - (c) Ensure that DOE policies, procedures, and standards for special nuclear material safeguards are at least equivalent in their effectiveness to policies, procedures, and standards established by the Nuclear Regulatory Commission.
  - (d) Assure that the data documentation and collection policies, procedures, and standards of DOE with respect to nuclear safeguards are comparable to those of Nuclear Regulatory Commission.
  - (e) Provide technical advice, analyses, and recommendations in developing international safeguards policies and procedures.
  - (f) Ensure the maintenance and currency of the DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION.
  - (g) Provide specific written guidance that would assist license-exempt contractors and subcontractors to design, evaluate, and validate materials control and accountability systems.
- (2) Conduct/participate in special investigations of activities of license-exempt contractors and other contractors possessing DOE-owned nuclear materials, as necessary. Coordinate these special investigations with the appropriate Heads of Headquarters Elements and Operations Offices.
- (3) In consultation with Heads of Headquarters Elements, initiate and direct programs for providing required technology, equipment, and procedures to meet safeguards objectives and for assuring that Government and industry are provided with chemical and isotopic reference standards and calibration and test materials which are supportive of safeguards programs.
- (4) In connection with activities of license-exempt contractors and subcontractors, recommend to the responsible authority corrective

action to assure compliance with overall safeguards policies, procedures, and requirements, and, as appropriate, recommend other courses of action.

- (5) Prepare reports and provide data for reports, through the Director of Security Affairs and the Director of Nonproliferation and National Security, to the Secretary on the status of the safeguards program.
- (6) In connection with the maintenance of records and data to support the implementation of nuclear material accountability, ensure:
  - (a) Collection and processing of data relative to nuclear materials for which the United States has a safeguards or management interest as required-by directives, U.S. statutes, and international treaty and agreement provisions.
  - (b) Issuance of reports to support the nuclear materials safeguards needs of DOE, Nuclear Regulatory Commission, other Government organizations, and the International Atomic Energy Agency.
  - (c) Headquarters level overview of key materials control and accountability data including: materials control and materials accounting survey reports; inventory differences; and shipper/receiver differences.
  - (d) Maintain historical records of nuclear material transactions, material balances, and inventories in support of safeguards and other programs of the Government.
  - (e) Review and approve proposed methods for submission of nuclear materials data to the Nuclear Materials Management and Safeguards System by use of telecommunications systems in lieu of the required forms referred to in Chapter II, if the proposed methods satisfy all applicable requirements.
  - (f) Establish and deactivate Reporting Identification Symbols for organizations sponsored by Heads of Headquarters Elements and Operations Offices.
- (7) In connection with international agreements, recommend corrective action to assure compliance with overall safeguards policies, procedures, and standards.
- (8) Develop and implement materials control and accountability training programs for DOE and DOE contractor safeguards personnel. Ensure that minorities, women, and persons with disabilities are accorded equal opportunity to receive this training.

d. Director of Arms Control and Nonproliferation shall:

- (1) Manage programs for technical cooperation with the International Atomic Energy Agency as part of the Office of Arms Control and Nonproliferation's safeguards role in guarding against the diversion of nuclear materials and equipment which had been supplied-for peaceful purposes to the manufacture of nuclear weapons, nuclear explosive devices, or any other military purpose.
- (2) Conduct onsite safeguards and security reviews of nuclear materials distributed abroad to the extent provided for in international, multinational, and bilateral agreements, and participate in international discussions regarding safeguards policies and procedures with other DOE organizations involved in international programs.
- (3) In coordination with Heads of Headquarters Elements, ensure compliance of DOE facilities with the terms of the "Agreement Between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America" and its associated Protocol.
- (4) In connection with international agreements, recommend corrective action to assure compliance with overall safeguards policies, procedures, and standards, and when appropriate recommend suspension of any agreements that do not meet DOE policy in regard to such arrangements.
- (5) Provide technical advice, analyses, and recommendations in developing international safeguards policies and procedures. Manage programs for technical cooperation with the International Atomic Energy Agency in its safeguards role in guarding against the diversion of nuclear materials and equipment to the manufacture of nuclear weapons, nuclear explosive devices, or any other military purpose.

e. Director, Naval Nuclear Propulsion Program shall, in accordance with the responsibilities and authorities assigned by Executive Order 12344 (statutorily prescribed by Public Law 98-525 (42 U.S.C. 7158, note)) and to ensure consistency throughout the joint Navy/DOE organization of the Naval Nuclear Propulsion Program, implement and oversee all policy and practices pertaining to this DOE Order for activities under the Director's cognizance.f. Heads of Field Elements shall:

- (1) Implement material control and accountability of nuclear materials for all DOE activities under their jurisdiction in conformity with the policies, procedures, planning, and other requirements set forth in the DOE 5630 series, and set policies, procedures, and requirements for nuclear materials not specifically covered in the 5630 series.
  - (a) Require that a Material Control and Accountability Plan be developed for each facility possessing nuclear materials and approve that plan and subsequent changes. Require development and

compliance with procedural directives implementing the Material Control and Accountability Plan.

- (b) Assure cost-effective overall protection at each site, through integration, to the extent practicable, of materials control and accountability systems, procedures, and operations with the associated physical protection systems, procedures, and operations.
  - 1 Utilize the design basis threat guidance to formulate site-specific threat statements for inclusion in applicable site-specific safeguards and security planning documents.
  - 2 Assure vulnerability assessments are required for Category I special nuclear material locations and for Category II locations where rollup to Category I is credible.
  - 3 Approve a classified list of threats and targets developed by each contractor under their jurisdiction as appropriate for design and/or evaluation and validation of materials control and accountability systems.
  - 4 Develop procedures for the conduct and reporting of nuclear materials surveys in accordance with DOE 5634.1B, FACILITY APPROVALS, SECURITY SURVEYS, AND NUCLEAR MATERIALS SURVEYS. Conduct oversight tests and evaluations of material control and accounting provisions of contractors' safeguards programs.
- (c) Ensure the maintenance of records and issuance of periodic reports reflecting nuclear materials transactions and inventories under their jurisdiction.
- (d) Ensure material control and accountability requirements are considered in all phases of design of new facilities/operations.
- (e) Ensure appropriate actions are taken to correct safeguards deficiencies.
- (f) Assure that system assessment requirements are identified and met for facilities possessing nuclear material.
- (2) Ensure that responsibilities and authorities for material control and accountability of nuclear materials are addressed in the Memorandums of Agreement and associated appendices between Heads of Headquarters Elements and Field Elements.
- (3) Monitor material control indicators and review and analyze reportable occurrences experienced in operations under their jurisdiction.
  - (a) Ensure that contractors and subcontractors under their jurisdiction analyze all nuclear material control indicators, determine the probable cause of all nuclear material alarms, and take such corrective action as is deemed necessary.



- (b) Report malevolent acts and other reportable occurrences to the Office of Safeguards and Security and affected Heads of Headquarters Elements consistent with the requirements of this Order and DOE 5000.39, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION.
  - (c) Require, as appropriate, each contractor, facility, and DOE Element under their reporting jurisdiction to determine the reasons for shipper-receiver differences, evaluate the significance of all such differences, and take appropriate corrective action.
- (4) Assure nuclear material control and accountability upgrade needs are identified, documented, and coordinated with affected Heads of Headquarters Elements consistent with budgetary schedules.
- (5) Provide materials control and accountability systems review and approval for all facilities prior to beginning new operations that might alter, the performance of existing materials control and accountability systems.
- (6) Require each DOE contractor and DOE element under their reporting jurisdiction to:
- (a) Prepare and distribute promptly the appropriate forms (see Chapter II), for documenting nuclear materials transactions, inventories, and material balances and for submitting the information to the Nuclear Materials Management and Safeguards System, in accordance with the DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION.
  - (b) Prepare additional data and reports required by the field element in the performance of its mission.
  - (c) If notified of selection under the provisions of the U.S./International Atomic Energy Agency Safeguards Agreement, prepare and submit material balance reports (DOE/NRC F 742, "Material Balance Report") indicating the sources of receipts shown on line 22 ("From Other Materials") and the destinations of removals shown on line 71 ("Degradation to Other Materials").
  - (d) Assure that for exports other than for mutual defense, the receiver's copies of DOE/NRC F 741, "Nuclear Material Transaction Report", DOE/NRC F 741A, "Nuclear Material Transaction Report (Continuation Page)," the special preprinted version of DOE/NRC F 740M, "Concise Note", and other appropriate versions of DOE/NRC F 740M, as required, are included with the actual shipment.
  - (e) Assure that both shipper's and receiver's transaction data is provided to the Nuclear Materials Management and Safeguards System in those cases where the shipper or receiver is a foreign entity.

- (f) Provide review of Nuclear Materials Management and Safeguards System output sufficient to verify data processed by the system.
  - (g) Assure that material balances held in contractors' systems are reconciled with corresponding Nuclear Materials Management and Safeguards System balances and that data corrections are implemented to bring the systems into agreement.
  - (h) Review proposed internal or computer-generated equivalent forms referred to in Chapter II, and if the proposed equivalents are found to provide for all the information on nuclear materials transactions, material balances, and inventories in the proper format, approve their use in lieu of the specified forms.
  - (i) Assure that the appropriate reporting procedures are followed by contractors under their jurisdiction.
  - (j) Assure that all required data is provided to the Nuclear Materials Management and Safeguards System in accordance with the instructions in the DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION.
- (7) Assure that this Order shall be implemented under existing and new contracts for operating facilities under the scope of this Order. Designate an individual(s) to be responsible for bringing to the attention of the contracting officer each procurement falling within the scope of this Directive. Unless another individual is designated, the responsibility is that of the procurement request originator (the individual responsible for initiating a requirement on DOE F 4200.33).
- (8) Through contracting officers require that:
- (a) Each contractor and subcontractor under their jurisdiction who may use or possess designated nuclear materials are required by contract to develop and maintain current written procedures for control and accountability of nuclear materials;
  - (b) Each contract under which nuclear materials are to be supplied contains appropriate safeguards provisions consistent with DOE policy; and
  - (c) Inventory and scrap levels of nuclear materials held by contractors and subcontractors under their jurisdiction are minimized to be consistent with operational needs and good safeguards practices.
- (9) Review and approve deviations to requirements of this Order according to procedures contained in DOE 5630.11B, SAFEGUARDS AND SECURITY PROGRAM.
- g. Heads of Departmental Elements (the senior ranking official at a DOE office location) shall include in a procurement request package, for each procurement requiring the application of this Order, the following:

(1) identification of the Order; (2) identification of the specific requirements with which a contractor or other awardee is to comply, or, if this is not practicable, identification of the specific paragraphs or other portions of this Order with which a contractor or other awardee is to comply; and (3) requirements for the flowdown of provisions of this Order to any subcontract or subaward. For application to awarded management and operating contracts, Heads of Departmental Elements may set forth this information in a written communication to the contracting officer rather than in a procurement request package.

h. Manager, Oak Ridge Operations Office, in addition to the requirements specified in paragraph 6f, above, shall:

- (1) Forward applicable copies of Nuclear Regulatory Commission and "Agreement State" licensee nuclear material transaction reports promptly to other concerned DOE elements and to appropriate foreign entities. In addition, the Manager shall maintain records that document all transfers of U.S. nuclear material to and from foreign entities and issue required inventory reports.
- (2) Maintain sufficient records to document the transfer of any U.S. supplied special nuclear material to foreign entities, the receipt of any U.S.-origin nuclear material into the U.S., and the transfer of any U.S.-origin nuclear material between foreign countries, including special nuclear material produced therein, in accordance with appropriate agreements. Retain all transfer documents, records, and reports for audit purposes.
- (3) Perform comparisons of U.S. export and import data with data supplied by foreign entities. Differences between foreign and U.S. data shall be investigated and reconciled by interacting with representatives of the relevant foreign entities and domestic nuclear facilities.
- (4) Extract information from documents used to transfer U.S. nuclear material from one foreign country to another and submit such data to the International Nuclear Materials Tracking System (INMTS) in accordance with "INMTS Data Entry Procedures."

i. Manager, Albuquerque Operations Office, in addition to the requirements specified in paragraph 6f, above, shall:

- (1) Report inventory data on nuclear material transferred to the Department of Defense under 42 U.S.C. §2121(b), as amended, with the exception of material specified in paragraph 6j, below to be reported by the Pittsburgh Naval Reactors Office.
- (2) Report inventory data on material loaned by the U.S. to a foreign nation under 42 U.S.C. §2121(c), as amended.
- (3) Maintain memorandum inventory accounts for all transfers of nuclear material to the Department of Defense under 42 U.S.C. §2121(b)-(c), with the exception of Navy cores and associated items. The Manager

shall provide guidance and instruction for the documentation and reporting, as necessary, to those offices making such transfers.

- j. Manager, Pittsburgh Naval Reactors Office, in addition to the requirements specified in paragraph 6f, above, shall:
- (1) Report inventory data on material transferred to the Department of Defense for nonweapons Naval reactor programs under 42 U.S.C. §2121(b), as amended.
  - (2) Maintain memorandum inventory accounts for transfers of nuclear materials in Navy cores and associated items to the Department of Defense under 42 U.S.C. §2121(b).
  - (3) Provide guidance, through the Director, Naval Reactors, for documentation and reporting of transfers to the Department of Defense of Navy cores and associated items under 42 U.S.C. §2121(b), as amended.
- k. Manager, Schenectady Naval Reactors Office, in addition to the requirements of paragraph 6f, above, shall provide guidance, through the Director, Naval Reactors, for documentation and reporting of transfers to the Department of Defense of Navy cores and associated items under 42 U.S.C. §2121(b), as amended.
7. IMPLEMENTATION. This Order will be implemented within 60 days after the effective date.
8. ASSISTANCE. Questions concerning this Order should be directed to the Chief, Materials Control and Accountability Branch, at 301-903-2536.

BY ORDER OF THE SECRETARY OF ENERGY:



ARCHER L. DURHAM  
Assistant Secretary for  
Human Resources and Administration

REFERENCES

1. Title 42 U.S.C. 2011, et. seq., "Atomic Energy Act of 1954," as amended, which establishes a program for Government control of the possession, use and production of atomic energy and special nuclear material, whether owned by the Government or others.
2. Title 10 Code of Federal Regulations Parts 1 to 199, Nuclear Regulatory Commission Regulations, which contain the regulations applicable to Nuclear Regulatory Commission and "Agreement State" licensees involved in activities concerning nuclear materials not subject to DOE requirements.
3. DOE 1270.2B, SAFEGUARDS AGREEMENT WITH THE INTERNATIONAL ATOMIC ENERGY AGENCY, of 6-23-92, which prescribes policies and responsibilities for compliance with the agreement, including the associated protocol, between the Federal Government and the International Atomic Energy Agency for the application of safeguards in the United States.
4. DOE 1360.2B, UNCLASSIFIED COMPUTER SECURITY PROGRAM, of 5-18-92, which establishes requirements, policies, responsibilities, and procedures for developing and sustaining a DOE unclassified security program.
5. DOE 5000.3B, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION, of 1-19-93, which establishes a DOE system for identification, categorization, notification, analysis, reporting, followup, and closeout of occurrence.
6. DOE 5400.1, GENERAL ENVIRONMENTAL PROTECTION PROGRAM, of 11-9-88, which establishes the environmental protection program for DOE Operations.
7. DOE 5480.1B, ENVIRONMENT, SAFETY, AND HEALTH PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS, of 9-23-86, which establishes the Department's environmental protection, safety, and health protection program.
8. DOE 5480.18A, ACCREDITATION OF PERFORMANCE-BASED TRAINING FOR CATEGORY A REACTORS AND NUCLEAR FACILITIES, of 7-19-91, which establishes a performance based training process for reactor and nonreactor nuclear facilities in DOE.
9. DOE 5480.20, PERSONNEL SELECTION, QUALIFICATION, TRAINING, AND STAFFING REQUIREMENTS AT DOE REACTOR AND NON-REACTOR NUCLEAR FACILITIES, of 2-20-91, which establishes the selection, qualification, training, and staffing requirements for personnel involved in the operation, maintenance, and technical support of DOE-owned reactors and nonreactor nuclear facilities.
10. DOE 5484.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS, of 2-24-81, which establishes the requirements and procedures for the investigation of occurrences having

environmental protection, safety, or health protection significance for DOE operations.

11. DOE 5500.1B, EMERGENCY MANAGEMENT SYSTEM, of 4-30-91, which establishes overall policy and requirements for a system that will provide for development, coordination, and direction of Department planning, preparedness, and readiness assurance for response to operational, energy, and Continuity of Government emergencies involving DOE or requiring Departmental assistance.
12. DOE 5630.11B, SAFEGUARDS AND SECURITY PROGRAM, of 8-2-94, which establishes the policy and responsibilities for the DOE Safeguards and Security Program.
13. DOE 5630.13A, MASTER SAFEGUARDS AND SECURITY AGREEMENTS, of 6-8-92, which establishes Departmental policy, requirements, and authorities for the development of Master Safeguards and Security Agreements.
14. DOE 5630.14A, SAFEGUARDS AND SECURITY PROGRAM PLANNING, of 6-9-92, which establishes a standardized approach to protection program planning, prescribes DOE policy, objectives, responsibilities, and authorities for that planning process, and consolidates site and master plan requirements.
15. DOE 5630.15, SAFEGUARDS AND SECURITY TRAINING PROGRAM, of 8-21-92, which establishes procedures for standardizing and implementing the DOE safeguards and security training program for safeguards and security personnel, and prescribes the policy, responsibilities, and authority for that training program.
16. DOE 5630.16A, SAFEGUARDS AND SECURITY ACCEPTANCE AND VALIDATION TESTING PROGRAM, of 6-3-93, which establishes requirements for integrated performance testing of personnel, procedures, and equipment to demonstrate the adequacy and effectiveness of the safeguards and security performance requirements mandated under DOE directives.
17. DOE 5630.17, SAFEGUARDS AND SECURITY (S&S) STANDARDIZATION PROGRAM, of 9-29-92, which provides policies, procedures, responsibilities, and authority for the Safeguards and Security Standardization Program to ensure the most effective and efficient use and procurement of safeguards and security equipment and systems.
18. DOE 5631.6A, PERSONNEL SECURITY ASSURANCE PROGRAM, of 9-15-92, which establishes policies, objectives, procedures, responsibilities, and authorities for a Personnel Security Assurance Program.
19. DOE 5632.1C, PROTECTION AND CONTROL OF SAFEGUARDS AND SECURITY INTERESTS, of 7-15-94, and DOE M 5632.1C-1, MANUAL FOR PROTECTION AND CONTROL OF SAFEGUARDS AND SECURITY INTERESTS, of 7-15-94, which establish Departmental policies and procedures related to the physical protection of DOE property and security interests.

20. DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION, to be published concurrently with this Order, which details the data elements and procedures required to document and report nuclear materials transactions, material balances, and inventories to the Nuclear Materials Management and Safeguards System.
21. DOE 5634.1B, FACILITY APPROVAL, SECURITY SURVEYS, AND NUCLEAR MATERIALS SURVEYS, of 9-15-92, which establishes requirements for the conduct of onsite security or nuclear materials surveys of facilities with DOE safeguards and security interests.
22. DOE 5639.6A, CLASSIFIED AUTOMATED INFORMATION SYSTEM SECURITY PROGRAM, of 7-15-94, which establishes requirements, policies, and responsibilities for the development and implementation of a Departmental program to ensure the security of information stored in classified computer systems.
23. DOE 5700.6C, QUALITY ASSURANCE, of 8-21-91, which establishes quality assurance requirements for DOE.
24. DOE 5820.2A, RADIOACTIVE WASTE MANAGEMENT, of 9-26-88, which establishes policies, guidelines, and minimum requirements for managing radioactive and mixed waste.
25. DOE 6430.1A, GENERAL DESIGN CRITERIA, of 4-6-89, which provides subject criteria for use in the acquisition of Departmental facilities.
26. ANSI N15.19-89, "Nuclear Material Control - Volume Calibration Techniques" American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018 (1989).
27. ANSI N15.36-83, "Nuclear Materials - Nondestructive Assay Measurement Control and Assurance," American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018 (1983).
28. ANSI N15.41-84, "Nuclear Facilities - Derivation of Measurement Control Programs - General Requirements," American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018 (1984).
29. ANSI N15.51-90, "Measurement Control Programs Nuclear Materials Analytical Chemistry Laboratory," American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018 (1991).
30. ANSI N15.54-90, "Instrumentation - Radiometric Calorimeters Measurement Control Program," American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018 (1991).
31. ASTM Standard C993-92, "Guide for In-Plant Performance of Automatic Pedestrian SNM Monitors," American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (7-93).

32. ASTM Standard C1112-93, "Guide for Application of Radiation Monitors to the Control and Physical Security of Special Nuclear Material," American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (6-93).
33. ASTM Standard C1169-92, "Guide for Laboratory Evaluation of Automatic Pedestrian SNM Monitor Performance," American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (5-93).
34. ASTM Standard C1189-91, "Guide to Procedures for Calibrating Automatic Pedestrian SNM Monitor," American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 (7-91).
35. ASTM Standard C1236-93, "Guide for In-Plant Performances Evaluation of Automatic Vehicle SNM Monitors," American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa 19103 (6-93).
36. ASTM Standard C1237-93, "Guide to In-Plant Performance Evaluation of Hand-Held SNM Monitors," American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa 19103 (6-93)
37. CG-SS-3, "Classification Guide for Safeguards and Security Information," of August 1994, issued by the Director of Declassification, which provides original classification determinations for National Security Information concerning nuclear safeguards and various aspects of security and to provide guidance for derivatively classifying documents and materials containing such National Security Information, Restricted Data, and Formerly Restricted Data.
38. "DESIGN BASIS THREAT POLICY FOR THE DEPARTMENT OF ENERGY PROGRAMS AND FACILITIES (U)," of 9-7-94, issued by the Director of Security Affairs, which identifies and characterizes the range of potential generic adversary threats to the Department's nuclear programs and facilities which could adversely impact national security or the health and safety of Government and contractor employees, the public, or the environment.
39. DOE/NRC F 741/741A, NUCLEAR MATERIAL TRANSACTION REPORT, Office of Management and Budget Control Number 1910-1800, of 10-88, which is used for reporting values to Nuclear Materials Management and Safeguards System for external transfers of nuclear material.
40. "Guidance on Meeting DOE Order Requirements for Traceable Nondestructive Assay Measurements," Department of Energy, Office of Safeguards and Security (5-94).
41. "Guide for Implementation of DOE 5633.3A," of 2-93, issued by the Director of Security Affairs, which provides guidance in the understanding of materials control and accountability requirements contained therein.



42. "Guide for the Implementation of Safeguards and Security Directives," Department of Energy, Office of Safeguards and Security, (11-26-93) which itemizes standards and criteria that emanate from Safeguards and Security Program directives.
43. "Guide to the Evaluation of Selected Materials Control and Accountability (MC&A) Detection Elements," U.S. Department of Energy, Office of Safeguards and Security (5-94).
44. "Measurement Control Guide," U.S. Department of Energy, Office of Safeguards and Security (3-93) which provides guidance to assist in the implementation of measurement control requirements.
45. "Metal Detector Guide," U.S. Department of Energy, Office of Safeguards and Security (2-22-90).
46. "Safeguards and Security Definitions Guide," U.S. Department of Energy, Office of Safeguards and Security (12-20-93) which provides standardized definitions of terms used in the Safeguards and Security Program.
47. "Safeguards Seal Reference Manual," (9-91) DOE, Office of Safeguards and Security, which provides guidance to nuclear facility personnel in selecting, procuring, and applying the proper seals for safeguarding nuclear material.
48. "Sample Master Safeguards and Security and Vulnerability Assessment (Volume III - MSSA Verification Process)," U.S. Department of Energy, Office of Safeguards and Security (1991).

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## CHAPTER I

### BASIC REQUIREMENTS

1. GENERAL. This chapter provides minimum requirements for the control and accountability of nuclear materials.
  - a. Special nuclear material shall not be received, processed, or stored at a facility until facility approval has been granted in accordance with the requirements of DOE 5634.1B, FACILITY APPROVAL, SECURITY SURVEYS, AND NUCLEAR MATERIALS SURVEYS.
  - b. Nuclear materials (Figure I-1) shall be controlled and accounted for as required by this Order. A graded material control and accountability program shall be implemented by Managers, Operations Offices, using requirements for Category IV as the minimum for nuclear materials. See page I-9, paragraph 3c, for requirements for depleted uranium. The level of control and accountability shall be consistent with the economic and strategic value of these materials. Figure I-1 provides a list of nuclear materials and reportable quantities. Page I-6, paragraph 2b defines categorization of nuclear materials for implementation of DOE's graded safeguards program. Detailed information on reporting requirements for materials accounting data and information can be found on page II-19, paragraph 7.
  - c. A management official responsible for the control and accountability of nuclear materials shall be designated for each facility. This official shall be organizationally independent from responsibility for other programs. A Nuclear Materials Representative responsible for nuclear materials reporting and data submission to the Nuclear Materials Management and Safeguards System shall be designated for each facility or site having a Reporting Identification Symbol.
  - d. For each facility, facility management shall maintain documentation defining authorities and responsibilities for materials control and accountability functions (e.g., accounting system, measurements, measurement control, inventories, audit, material access controls, and surveillance). For each facility, there shall be a program to assure that personnel performing materials control and accountability functions are trained and qualified to perform their duties and responsibilities, and are knowledgeable of requirements and procedures related to their functions.
  - e. A Materials Control and Accountability Plan shall be developed for each facility possessing nuclear materials (including facility review and frequency and change control), and approved by the cognizant Manager, Operations Office. The Materials Control and Accountability plan may, at the option of the cognizant Manager, Operations Office, be a separate document or a part of an existing document such as a Site Safeguards and Security Plan.

MATERIAL TYPE	SNM, SOURCE, OR OTHER	REPORTABLE QUANTITY*	HEIGHT FIELDS USED FOR REPORTING		MATERIAL TYPE CODE
			ELEMENT	ISOTOPE	
Depleted Uranium	SOURCE	Kilogram	Total U	U-235	10
Enriched Uranium <sup>1</sup>	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>2</sup>	SNM	Gram	Total Pu	Pu-242	40
Plutonium-239-241	SNM	Gram	Total Pu	Pu-239 + Pu-241	50
Plutonium-238 <sup>3</sup>	SNM	Tenth of a Gram	Total Pu	Pu-238	83
Americium-241	OTHER	Gram	Total Am	Am-241	44
Americium-243	OTHER	Gram	Total Am	Am-243	45
Berkelium	OTHER	Microgram	-	Bk-249	47
Californium-252	OTHER	Microgram	-	Cf-242	48
Curium	OTHER	Gram	Total Cm	Cm-246	46
Deuterium	OTHER	Tenth of a Kilogram	D <sub>2</sub> O	D <sub>2</sub>	86
Lithium-6	OTHER	Kilogram	Total Li	Li-6	60
Neptunium-237	OTHER	Gram	Total Np	-	82
Thorium	SOURCE	Kilogram	Total Th	-	88
Tritium <sup>4</sup>	OTHER	Hundredth of a Gram	Total <sup>3</sup> H	-	87

Figure I-1  
Nuclear Materials

\* For reporting purposes: materials are reported to the nearest whole unit except for plutonium-238, deuterium, and tritium.

<sup>1</sup> Uranium in cascades is treated as enriched uranium. For reporting purposes uranium in cascades should be reported as material type 89.

<sup>2</sup> Report as plutonium-242 if the contained Pu-242 is 20% or greater of total plutonium by weight; otherwise report as plutonium 239-241.

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

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

- (1) Category I and II. For facilities possessing Category I and II quantities of special nuclear material, the plan shall reflect requirements for materials control and accountability program planning and management, threat considerations, performance criteria, the accounting system, physical inventories, measurement control, control limits, loss detection elements, training, response to nuclear material alarms, access control, anomaly resolution, containment, and surveillance.
  - (2) Category III and IV. For Category III and IV facilities, requirements for the scope and content of Materials Control and Accountability Plans are to be determined by the Manager, Operations Office.
- f. Planning for materials control and accountability shall consider the potential of an insider threat, as detailed in "DESIGN BASIS THREAT POLICY FOR THE DEPARTMENT OF ENERGY (DOE) PROGRAMS AND FACILITIES (U)", issued by the Office of Security Affairs. Planning shall address the theft and diversion of special nuclear material, and the unauthorized control of a weapon, test device, or improvised nuclear device, where appropriate. The materials control and accountability program shall support activities to mitigate sabotage.
  - g. For each facility, facility management shall have and require compliance with one or more current procedural directive(s) for implementing its Materials Control and Accountability Plan. These procedures shall be compatible with the physical protection and security requirements of DOE 5632.1C, PROTECTION AND CONTROL OF SAFEGUARDS AND SECURITY INTERESTS, to provide an effective integrated safeguards system. These procedural directives shall be transmitted to the cognizant Manager, Operations Office, when issued and when revised.
  - h. Reportable occurrences shall be reported in accordance with the notification and reporting requirements contained in DOE 5000.3B, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION.
  - i. Facility emergency plans shall address conditions that indicate possible loss of control of special nuclear material. The emergency plan shall be consistent with safeguards and security directives, and shall specify materials control and accountability measures to be taken prior to resumption of operations following emergency operations. Other requirements for facility emergency plans are specified in DOE 5500.1B, EMERGENCY MANAGEMENT SYSTEM.
  - j. For Category I facilities and for Category II facilities within the same Protected Area for which rollup to a Category I quantity is possible, each facility's safeguards and security system shall provide defense-in-depth to assure that the failure or defeat of a single component will not increase the level of risk for the system above an acceptable level. A part of the vulnerability assessment process shall be to determine the extent to which the failure or defeat of a single component increases this risk and if the increase in risk is

acceptable. When the increase in risk exceeds an acceptable level, compensatory measures shall be immediately taken and upgrades to the system shall be initiated. The acceptability-of the risk shall be documented as a part of the Master Safeguards and Security Agreement or Site Safeguards and Security Plan for the facility.

- k. For each facility a materials control and accountability program shall be established for all nuclear materials on inventory under a three letter Reporting Identification Symbol, including those designated as uneconomical to recover. For Attractiveness Level D or higher special nuclear material that has been removed from inventory as waste and for which a vulnerability resulting in an unacceptable level of risk has been identified, the Manager, Operations Office, or the cognizant Head of a Headquarters Element may require that applicable nuclear material safeguards measures as outlined in this Order be maintained and/or implemented. Otherwise, materials previously removed from inventory that meet all of the following conditions are exempt from the requirements of this Order:
  - (1) They have been declared as waste prior to issuance of this Order;
  - (2) They have been written off the materials control and accountability records; and
  - (3) They are under the control of a waste management organization.
- l. To terminate safeguards for nuclear materials currently on inventory and to exempt that material from the requirements of this Order, all of the following conditions must be met:
  - (1) If the material is special nuclear material, it must meet the definition of Attractiveness Level E material. (In some cases, it may be necessary to dispose of higher attractiveness level materials. Concurrence of both the appropriate Head of a Headquarters Element and Office of Safeguards and Security is required for termination of safeguards on materials which meet the definition of Attractiveness Level D or greater. Additionally, whenever termination of safeguards on a Category II or greater quantity of special nuclear material is being considered, a vulnerability assessment must be conducted.)
  - (2) The material must be determined to be discardable by the Manager, Operations Office in accordance with guidelines provided by the Office of Nuclear Weapons Management, the Departmental nuclear materials managers.
  - (3) The material must be written off the materials control and accountability books and removed from its nuclear processing area (or material balance area) to a storage or disposal area containing only discardable material.
- m. Identification of a facility for decommissioning, closure, or deactivation shall not exempt the facility from compliance with requirements stated in this Order. The facility's materials control

and accountability program shall be maintained at a level appropriate to the category and attractiveness level of the nuclear material on inventory until a termination survey determines that there is no nuclear material remaining at the facility. Such a determination may be made if there is no material or the only material is waste material that meets the definition of Attractiveness Level E and that material has been written off the materials control and accountability books. Requirements for termination surveys are contained in DOE 5634.1B. After a facility has transferred all its nuclear material except waste to another facility, the inventory balance is zero, and the termination survey has been completed, DOE/NRC F 741, "Nuclear Material Transaction Report," may still be needed for reporting shipment of waste to offsite waste-handling areas. In such cases, the capacity shall be maintained for generating DOE/NRC F 741 for these shipments until the waste management program puts into use its own accounting system for transfers.

- n. A vulnerability assessment shall be performed for each facility to evaluate the potential for unauthorized accumulation of a Category I quantity of special nuclear material from multiple locations within the same Protected Area through either a single occurrence or protracted diversion. The vulnerability assessment shall include consideration of the attractiveness level of the material and the credibility of the removal scenarios. For protracted diversion, the vulnerability assessment shall also include consideration of the number of removal events and the total elapsed time required to accumulate the target quantity during the inventory period. Credible accumulation scenarios shall be documented in DOE-approved Site Safeguards and Security Plans.
- o. Procedures, techniques, and standards as promulgated by the American Society for Testing and Materials (ASTM) and the American National Standards Institute (ANSI) shall be used, when such standards exist, in developing the basis for nuclear material control, measurements and measurement control, accounting, and statistical methods that are employed by a facility for safeguarding of nuclear material, unless otherwise directed by DOE directives. Standards issued by the International Atomic Energy Agency and the Nuclear Regulatory Commission should also be used when appropriate and when consistent with DOE regulatory goals.
- p. Materials control and accountability requirements contained in this Order shall apply to all DOE facilities, including new and renovated DOE nuclear facilities. The planning, design, construction, and operation of new or renovated facilities should incorporate the latest materials control and accountability technologies, systems, and approaches. Using modern techniques and equipment to maximize material loss detection sensitivity and to increase the quality of accountability measurements will reduce the magnitude of inventory difference control limits calculated as a part of inventory difference evaluations and will increase the quality of other analyses. performance requirements for inventory difference control limits for such facilities are contained on page I-10, paragraph 4.



- q. The "Guide for Implementation of DOE 5633.3A" shall be considered in developing materials control and accountability programs. This guide goes not establish or originate policy. Instead, it describes methods for meeting requirements of this Order.
  - r. Nuclear materials designated as radioactive waste are subject to the requirements of this Order unless exempted from its requirements by paragraphs 1k or l above. In addition to requirements of this Order, the handling, disposal, and management of nuclear materials designated as radioactive waste must be in compliance with DOE environmental and waste management regulations including DOE 5820.2A, RADIOACTIVE WASTE MANAGEMENT.
2. GRADED SAFEGUARDS. The following presents basic information and requirements for graded safeguards. Additional requirements will be found throughout this Order.
- a. Operations Offices and facilities shall establish and follow a graded safeguards program for nuclear materials. Graded safeguards is the concept of providing the greatest relative amount of control and effort to the types and quantities of special nuclear material that can be most effectively used in a nuclear explosive device. Categories of nuclear material for implementation of DOE's graded safeguards program are shown in Figure I-2. The "Guide for Implementation of DOE 5633.3A" contains more descriptive guidance for material attractiveness and examples of category determination.
  - b. Determination of material category for a special nuclear material location (Materials Balance Area, Material Access Area, Protected Area, facility, etc.) is required for a variety of safeguards and security purposes. In many cases, the material category is determined directly from Figure I-2. In cases where the material category determination requires consideration of multiple material types and attractiveness, directions for determining the material category are given in the following subparagraphs. When a facility can demonstrate that the accumulation of smaller quantities of special nuclear material from within a Materials Balance Area is not credible, the summation of these quantities need not be used to define the category quantity. Determination of category involves grouping materials by special nuclear material type, attractiveness level, and quantity. Material quantities are element weights for plutonium and U-233 and isotope weights for U-235. Procedures for determining material category are as follows:
    - (1) One Special Nuclear Material Type, One Attractiveness Level: Sum the material in the attractiveness level and determine the category from Figure I-2.
    - (2) One Special Nuclear Material Type, Multiple Attractiveness Levels, a Category III or greater quantity of B level material included:
      - (a) Determine the amounts of special nuclear material for materials in each of Attractiveness Levels B, C, and D.

FIGURE I-2  
Nuclear Material Safeguards Categories

Attrac- tiveness Level	PU/U-233 Category (QUANTITIES IN KGS)				CONTAINED U-235 Category (QUANTITIES IN KGS)				OTHER NUCLEAR MATERIAL
	I	II	III	IV <sup>1</sup>	I	II	III	IV <sup>1</sup>	
<b>WEAPONS</b> Assembled weapons and test devices	All Quan- tities	N/A	N/A	N/A	All Quan- tities	N/A	N/A	N/A	N/A
<b>PURE PRODUCTS</b> Pits, major components, buttons, ingots, recastable metal, directly convertible materials	≥2	≥0.4 < 2	≥0.2 < 0.4	< 0.2	≥5	≥1 < 5	≥0.4 < 1	< 0.4	N/A
<b>HIGH-GRADE MATERIAL</b> Carbides, oxides solutions (≥25g/l) nitrates, etc., fuel, elements and assemblies, alloys and mixtures, UF <sub>4</sub> or UF <sub>6</sub> (≥50% U-235)	≥6	≥2 < 6	≥0.4 < 2	< 0.4	≥20	≥6 < 20	≥2 < 6	< 2	N/A
<b>LOW-GRADE MATERIAL</b> Solutions (1-25g/l). process residues requiring extensive reprocessing, moderately irradiated material, Pu-238 (except waste), UF <sub>4</sub> or UF <sub>6</sub> (≥20% < 50% U-235)	N/A	≥16	≥3 < 16	< 3	N/A	≥50	≥8 < 50	< 8	N/A
<b>ALL OTHER MATERIALS</b> Highly irradiated forms, solutions (≥1g/l), uranium containing <20% U-235 (any form or quantity)	N/A	N/A	N/A	Report- able Quan- tities	N/A	N/A	N/A	Report- able Quan- tities	Report- able Quan- tities

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

<sup>2</sup> See paragraphs 3b and 3c for MC&A requirements for tritium and depleted uranium.

- (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 Figure I-3.
- (c) Sum the effective amounts in Attractiveness Levels B and C.
- (d) Compare the total effective amount as calculated in subparagraph (c) above to the amounts in Attractiveness Level B from Figure I-2.
- (e) Compare the amount of Attractiveness Level D to Figure I-2.
- (f) The material category is the highest level of material category determined in subparagraphs (a) through (d) or in subparagraph (e).

Attractiveness Level	Pu/U-233 Factor	U-235 Factor
B	1	1
C	1/3	1/4

Figure I-3  
Effective Quantities

- (3) One Special Nuclear Material Type, Multiple Attractiveness Levels, less than a Category III quantity of B level material included:
  - (a) Determine the amounts of special nuclear material for all attractiveness levels.
  - (b) Compare the total amounts in each level to the amounts in Figure I-2.
  - (c) The material category level is the highest level of the material categories determined in subparagraphs (a) and (b).
- (4) Multiple Special Nuclear Material Types:
  - (a) Determine the category for each special nuclear material type following the above procedures.
  - (b) The category is that determined for the individual special nuclear material type that requires the highest level of protection.

### 3. MATERIALS CONTROL AND ACCOUNTABILITY REQUIREMENTS FOR SOURCE AND OTHER NUCLEAR MATERIALS.

- a. Except for tritium and depleted uranium, source and other nuclear materials shall be treated as Attractiveness Level E materials. Therefore, the

requirements for a Materials Balance Area containing only source and other nuclear materials shall be that of Category IV. When source and other nuclear materials are present in Materials Balance Areas containing special nuclear material, only the special nuclear material is used to determine the category of the Materials Balance Area. However, source and other materials are subject to Category IV requirements.

- b. Tritium is a nuclear material of strategic importance; therefore, graded safeguards programs for tritium shall be established and followed equivalent 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. Depleted uranium is a material of limited strategic and monetary value, therefore, the requirements of this Order do not apply to depleted uranium except as follows:
  - (1) For Materials Balance Areas containing more than 10 metric tons of depleted uranium or having transactions of depleted uranium totaling more than 10 metric tons per year, the depleted uranium shall be treated as Category IV, Attractiveness Level E, material.
  - (2) For reporting identification symbols containing more than 10 metric tons of depleted uranium or having transactions of depleted uranium totaling more than 10 metric tons per year, documentation and reporting of depleted uranium transactions and inventories shall be in accordance with page II-19, paragraph 7.
  - (3) For depleted uranium not required to be handled as Category IV, Attractiveness Level E, material, the following minimum requirements apply:
    - (a) Procedures shall be developed and implemented to detect unauthorized internal transfers of depleted uranium.
    - (b) An accounting system shall be maintained that describes depleted uranium transactions and inventories.
    - (c) For external transfers, the shipper shall obtain written verification and maintain documentation that the intended receiver is authorized to accept the material before the material is transferred.
  - (4) Facilities selected under DOE 1270.2B, SAFEGUARDS AGREEMENT WITH THE INTERNATIONAL ATOMIC ENERGY AGENCY, are required to meet requirements for depleted uranium defined in the Facility Attachment document. Additionally, transfers of depleted uranium involving either (a) exports

or imports of depleted uranium or (b) movements of depleted uranium within the U.S. in which any part of the country control code represents a foreign country shall be tracked and reported in accordance with requirements on page II-19, paragraph 7.

#### 4. LOSS DETECTION ELEMENT EVALUATION.

- a. Vulnerability Assessment. Detailed vulnerability assessments identifying and evaluating the capability for detection of a loss of a Category I quantity of special nuclear material shall be developed by each Category I facility and approved by the head of the Operations Office materials control and accountability organization. Requirements for preparation of the Site Safeguards and Security Plan documents shall be used as the basis for these assessments. Vulnerability assessments shall cover the full threat spectrum specified in Office of Safeguards and Security guidance. Potential targets shall include all Category I areas and any Category II or III areas for which a credible scenario for unauthorized accumulation of a Category I quantity has been identified. Performance testing programs shall be developed to support and verify vulnerability assessments. Vulnerability assessments shall be reviewed annually and updated when system changes or new information indicate a potentially significant change in the risk of unauthorized removal of Category I quantities of special nuclear material. Results of reviews including changes in vulnerability assessments shall be documented and classified in accordance with CG-SS-3.
- b. Performance Testing. DOE 5630.16A, SAFEGUARDS AND SECURITY ACCEPTANCE AND VALIDATION TESTING PROGRAM, contains requirements for the design, planning, and documentation of performance tests. Materials control and accountability performance testing programs shall meet the requirements of DOE 5630.16A. For each facility, management shall establish and implement a documented testing program to verify materials control and accountability procedures and practices and to demonstrate that material controls are effective.
  - (1) These tests shall be designed to demonstrate that the system is functional and to assure that the system performs as specified and/or required. In addition, facilities shall:
    - (a) Identify those components of the materials control and accountability system that provide the greatest effectiveness against theft and diversion;
    - (b) Design, conduct, and document tests which substantiate component effectiveness; and
    - (c) Integrate the results of these component tests into safeguards and security vulnerability assessments.
  - (2) Performance testing shall include not only those elements that can detect-in-time-to-prevent but also those elements that can effectively account for special nuclear material in order to provide assurance that safeguards and security systems are functioning properly.

- (3) The design of the performance testing program shall be focused on testing individual detection elements. Elements identified in a vulnerability assessment that contribute to detection capability shall be tested on a frequency based on the level of threat/risk established by the vulnerability assessment.
- (4) The design of performance tests should consider prudent judgment and use of resources.
  - (a) The scope and extent of testing should be based on the graded safeguards concept with the testing program including more testing for higher category facilities than for lower category facilities.
  - (b) Guidance for performing testing is contained in DOE's Master Safeguards and Security Agreement Verification Guide (Section 4.0, Performance Testing; Appendix F., Checklist for Performance Requirements; and Appendix G., Materials Control and Accountability Checklist). In addition, Office of Safeguards and Security has provided guidance for the evaluation of the detection elements of the materials control and accountability system which will facilitate the design and validation of the performance testing program in the "Guide to the Evaluation of Selected Materials Control and Accountability (MC&A) Detection Elements."
- (5) Testing data and results shall be classified in accordance with CG-SS-3.
- (6) Corrective actions shall be taken for vulnerabilities identified during system testing.
- c. Materials Control and Accountability Performance Requirements. Minimum performance requirements for selected materials control and accountability system elements are given in Figure I-4 on page 1-12. Validation of these system elements shall be accomplished by performance testing. Testing shall be established at a frequency which, at a minimum, shall be in accordance with DOE 5630.16A and shall be documented in the Materials Control and Accountability Plan. When these system elements fail to meet performance requirements, a corrective action plan shall be developed and where necessary compensatory measures shall be taken. Testing of access controls and material surveillance shall be facility-specific with the scope and the extent of the testing documented by facility management and approved by the Manager, Operations Office. A sufficient number of items and tamper-indicating devices shall be tested to assure that on an annual basis the performance requirements for tamper-indicating devices and accounting records are met with 95% confidence for Category I and II items. Confidence levels for Category III and IV items shall be approved by the Manager, Operations Office. Testing to assure that tamper-indicating devices are properly in place shall include checking to see that the tamper-indicating device has been properly applied and there is no indication that the integrity of the tamper-indicating device has been violated. (The testing for this requirement is not intended to require destruction of properly applied tamper-indicating devices whose integrity has not been violated.) Additional guidance for testing metal detectors is given in the "Metal Detector Guide." In the performance requirement for inventory differences, "throughput" means

Access Controls. Performance tests shall be designed and conducted to fully evaluate the effectiveness of access controls-for Category I and II quantities of special nuclear material. In at least 95% of the tests conducted, the tests shall demonstrate the detection of unauthorized access to Category I and II quantities of special nuclear material.

Material Surveillance. Performance tests shall be designed and conducted to fully evaluate the effectiveness of material surveillance activities for Category I and II quantities of special nuclear material. In at least 95% of tests conducted, the tests shall demonstrate the detection of unauthorized actions related to the control of Category I and II quantities of special nuclear material.

Tamper-Indicating Devices. The tamper-indicating device record system shall accurately reflect the location and identity of tamper-indicating devices in at least 99% of the cases. The tamper-indicating device program shall assure that tamper-indicating devices are properly in place in at least 95% of the cases.

Portal Monitoring. In addition to performance testing necessary to verify that vulnerability assessment or Operations Office detection requirements are being met, testing of portal monitors (special nuclear material and metal) shall include all applicable tests described in American Society for Testing and Materials guides unless otherwise directed by Office of Safeguards and Security. When standards set in applicable American Society for Testing and Materials guides are not met, compensatory actions shall be taken.

Accounting Record Systems. The accounting record system shall accurately reflect item identity and location in at least 99% of the cases.

Inventory Confirmation/Verification Measurements. For Category I and II items, the acceptance/rejection criteria for verification measurements and where possible for confirmatory measurements shall be based on the standard deviation for the measurement method under operating conditions. The control limits for such criteria shall be set at no wider than three times the standard deviation for the method. The Managers, Operations Offices, should review and approve the control limits. When limits based on three standard deviations are unreasonably large, the Manager, Operations Office, may require tighter limits.

Inventory Difference Control Limits. Limits-of-error for inventory differences of processes in new Category I and II facilities shall be no larger than the smaller of a Category II quantity of special nuclear material or 2% of total throughput and active inventory.

Figure I-4  
Performance Requirements for Materials Control and Accountability Elements

measured output including waste, and "active inventory" means those materials in the Materials Balance Area that enter into the limit-of-error calculation. Additional or more stringent performance requirements for system elements may be established by the Manager, Operations Office, or the responsible Head of Headquarters Element. Paragraphs 6d(2) of this Chapter; 2c(3) and 4e(1)(f) in Chapter II; 2b, 3b(1), and 5c in Chapter III of this Order contain requirements that can be readily performance tested. Testing of system elements associated with these requirements should be included as a regular part of the performance testing program.

- d. Performance Requirements Compliance Schedule. Factors for determining when facilities must demonstrate full compliance with the materials control and accountability performance requirements include the following:
- (1) Timelines for implementing performance testing requirements in DOE 5630.16A;
  - (2) Requirements for the development of and availability of testing data used to support the Site Safeguards and Security Plans/Master Safeguards and Security Agreements; and
  - (3) Effective and implementation dates that were established by DOE 5633.3A. That Order required the development of a document, within 9 months of 2-12-93, that specifies how the requirements in that Order and those specified by the Manager, Operations Office, are being met.

Based upon the above, facilities should be demonstrating compliance with performance requirements for those materials control and accountability elements that detect-in-time-to-prevent as of the effective date of this Order. For all other elements, compliance should be demonstrated no later than 11-12-94.

5. OCCURRENCE INVESTIGATION AND REPORTING. Each facility shall identify materials control and accountability loss detection elements for each Materials Balance Area and shall establish a graded program for monitoring these elements and associated data to determine the status of nuclear material inventories and to identify reportable occurrences. Reportable occurrences involving Category I, II, and III nuclear materials shall be reported as an Emergency, Unusual Occurrence, or Off-Normal Occurrence in accordance with DOE 5000.3B. For reportable occurrences involving Category IV nuclear materials, the Manager, Operations Office, will define the extent of the investigation required to resolve the occurrence. When losses of Category IV nuclear materials which have been identified as credible radiological sabotage targets or when radiological sabotage events involving Category IV materials have occurred, reporting and investigation under DOE 5000.3B may be required. The categorization of materials control and accountability occurrences are contained in DOE 5000.3B. In addition to the reporting required by DOE 5000.3B, the DOE facility representative, as defined in DOE 5000.3B, shall notify the head of the appropriate division within the cognizant Operations office responsible for the implementation of this Order. The head of the appropriate Operations office division is responsible for notifying Office of Safeguards and security and the local office of the Federal Bureau of Investigation of reportable occurrences for which there is both an



indication of a loss of nuclear material and evidence of a malevolent act. In addition, the Operations Office shall independently evaluate the occurrence based upon its significance. Information related to monitoring and assessment activities shall be documented and retained.

6. ADMINISTRATIVE CONTROLS. For each facility, management shall establish a graded program to ensure the integrity and quality of materials control and accountability systems and procedures, and to periodically review and evaluate these systems. This program shall be described in the facility's Materials Control and Accountability Plan and specifically address the following criteria:
- a. Facility materials control and accountability procedures shall be reviewed and approved (prior to implementation) by facility operations management at a level of authority sufficient to ensure compliance by operations personnel. Procedures shall be consistent with the approved facility Materials Control and Accountability Plan, and procedures shall be distributed to all applicable organizations and individuals in the facility having materials control and accountability responsibilities.
  - b. For each facility, management shall establish procedures for emergency conditions and periods when materials control and accountability system components are inoperative. These procedures shall be designed to assure that access to or removal of special nuclear material would be detected during these periods.
  - c. For each facility, management shall establish controls that limit access to the accounting system and nuclear materials accounting data. For automated systems, controls shall be designed to deter and detect unauthorized access to the data bases and data processing systems that, through tampering, modification, or alteration could lead to defeat of the accounting system. Nuclear materials accounting data shall be protected in accordance with applicable classification, automated data processing, and computer security regulations.
  - d. The facility nuclear materials accounting system shall include checks and balances, and be structured to ensure:
    - (1) Identification of omission(s) of data for any reportable transaction.
    - (2) Timely detection (normally within 24 hours but in no case later than the subsequent inventory reconciliation) of errors/discrepancies in records associated with a Category I or II quantity of special nuclear material including where possible detecting falsified data and identifying the responsible person(s).
    - (3) Detection of data discrepancies and errors to ensure that no discrepancies exist in control indicator accounts.
    - (4) The completeness of the nuclear materials accounting system records.
  - e. For each facility possessing nuclear materials, facility management shall establish a program to periodically review and assess the integrity and quality of the materials control and accountability system. The assessment program shall address normal operations and emergency conditions. The

frequency of these assessments shall be on a graded basis, consistent with requirements of DOE 5634.1B, and approved by the Manager, Operations Office. The results of all assessments shall be classified if appropriate, reported to facility management, and each noted deficiency shall be addressed and corrected. The assessment shall be performed by personnel who are knowledgeable in materials control and accountability. Assessments shall be on a graded safeguards basis; at a minimum, the assessment program shall address the following:

- (1) Identification of abnormal situations.
- (2) Loss mechanisms, loss detection capabilities, and the localization of inventory differences.
- (3) Selection, maintenance, calibration, and testing functions to assure proper equipment and system performance.
- (4) Materials control and accountability system checks and balances, including separation of duties and responsibilities, that are used to identify irregularities and detect tampering with materials or materials control and accountability system components.
- (5) Change controls, including authorization requirements, to detect unauthorized or inappropriate modification of system components, procedures, or data. The change control system shall address requirements for review, authorization, documentation, notification, and controls on equipment selection, procurement, and maintenance.
- (6) Procedures and/or checks to assure the reliability and accuracy of materials control and accountability data and information.
- (7) Performance testing conducted by the facility. 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 materials control and accountability system components are inoperative.
- (9) Material containment, material access, and material surveillance procedures.
- (10) The physical inventory program and reconciliation practices.
- (11) Accounting system procedures, capabilities and sensitivities.
- (12) Identification of personnel with materials control and accountability responsibilities who should be included in the facility personnel security assurance program, consistent with national security requirements and DOE 5631.6A, PERSONNEL SECURITY ASSURANCE PROGRAM.
- (13) Measurement control program.
- (14) Tamper-indicating device programs.

- f. Reviews shall be conducted prior to startup of new facilities or operations, and whenever changes are made in facilities, operations, or materials control and accountability features that might alter the performance of the materials control and accountability system.
- g. In addition to the assessments in subparagraph f above, internal audits of the facility's materials control and accountability function shall be conducted by an organization independent of materials control and accountability to assess compliance with internal plans and procedures. The frequency of these audits shall be approved by the Manager, Operations Office.

CHAPTER II

MATERIALS ACCOUNTABILITY

1. GENERAL. This chapter describes the requirements for nuclear materials accountability and shall be applied in a manner consistent with the graded safeguards concept. The chapter is subdivided into five functional areas: accounting systems, inventories, measurements and measurement control, material transfers, and material control indicators.
2. ACCOUNTING SYSTEMS. Each facility shall have a system that provides 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. The accounting system shall provide a complete audit trail on all nuclear material from receipt through disposition. The Generally Accepted Accounting Principles, as promulgated by Financial Accounting Standards Board, shall be used in the design and operations of the nuclear material accounting system unless otherwise directed by DOE directives.
  - a. Accounting System Data Base and Procedures. For each facility, procedures shall be maintained describing the structure and operation of the nuclear materials accounting system. The procedures shall accurately reflect current nuclear material accounting practices. Specific requirements for accounting procedures include the following:
    - (1) A description of the inventory data base, including procedures for updating the inventory data and reconciling the inventory data with the results of physical inventories, and a description of the required data elements for each applicable material type.
    - (2) Identification of the accounting reports and their frequency, distribution and timeliness, consistent with accounting requirements.
    - (3) Identification of the organizational responsibilities for the management and operation of the accounting system.
    - (4) Recording, reporting, and submission of data to the national database, Nuclear Materials Management and Safeguards System, by material type and reporting unit, as specified on page II-19, paragraph 7.
  - b. Account Structure.
    - (1) A facility shall consist of one or more Materials Balance Areas established to identify the location and quantity of nuclear materials in the facility. For each facility,

readily retrievable accountability data shall be maintained by Materials Balance Area that reflects quantities of nuclear materials on inventory, quantities of nuclear material received and shipped, and other adjustments to inventory.

- (2) The Materials Balance Area account structure shall 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) One individual in each Materials Balance Area shall be designated by management to be responsible for ensuring that materials control and accountability policies are implemented in that Materials Balance Area.
- (4) Material types, processes, and functions shall be considered in establishment of Materials Balance Areas. The number of Materials Balance Areas shall be sufficient to identify and localize inventory differences and their causes.
- (5) A Materials Balance Area boundary shall not cross a Materials Access Area boundary. Each Materials Balance Area should conform to the single geographical area concept and be an integral operation. If more than one geographical area is included in one Materials Balance Area, all of these areas must be under the administrative control of the same individual, and the activities in these areas must be associated with an integral operation.

c. Records and Reports.

- (1) For each facility, management shall maintain records, submit data, and issue reports as required by page II-19, paragraph 7 and facility procedures. These reports shall accurately describe all nuclear material transactions and inventories. Inventory adjustments shall be identified by Materials Balance Area and shall be reported consistent with requirements of this Order, page II-19, paragraph 7.
- (2) Nuclear materials records shall be updated only by authorized personnel, and the records system shall provide an audit trail for all transactions affecting the nuclear materials database.
- (3) The Materials Balance Area records system shall be capable of being updated daily or upon demand for all nuclear materials transactions. (This requirement is for the updating of records based on reports or information; it is not a requirement on how quickly a facility must be able to complete measurements.) In addition, the records system shall be capable of generating book inventory listings for all special nuclear material within 3 hours. For all other nuclear material, the timing for generation of book

inventories shall be within 24 hours. Validating the accuracy of the accounting record system shall be conducted according to testing methodology, testing frequency, and record maintenance requirements contained in DOE 5630.16A and applicable Department guidance. Performance requirements for accounting record system accuracy are contained on page I-10, paragraph 4.

3. PHYSICAL INVENTORIES. Each facility's management shall implement a physical inventory program for nuclear materials consistent with the requirements defined below.
  - a. Periodic Physical Inventories.
    - (1) Physical Inventories. Inventories shall be based on measured values and, where feasible, measurements or technically justifiable estimates of holdup shall be made so that holdup quantities can be used in determining inventory values or explaining the inventory difference. Process monitoring techniques may be used for material which is undergoing processing and recovery operation but inaccessible for measurements by sampling. Process monitoring, in addition to material control procedures and specific action criteria, subject to the approval of the Manager, Operations Office, should be used routinely to track materials in process until operations permit an accountability measurement.
    - (2) Conduct of Inventories. For each facility, there shall be documented plans and procedures defining responsibilities for performing inventories and specifying criteria for conducting, verifying, and reconciling inventories of nuclear material. Verification of the presence of items during inventories may be performed on a statistical sampling basis. Sampling plans shall be consistent with the graded safeguards concept. Parameters for statistical sampling plans and inventory stratifications used with statistical sampling plans shall be defined by the facility management and approved by the Manager, Operations Office.
    - (3) Holdup Inventory. Holdup inventory shall be measured, where feasible, or estimated on the basis of throughput, process data, modeling, engineering estimates, or other technically justifiable factors as a regular part of inventory for facilities with Category I, II, and III quantities of special nuclear material and for facilities with Category IV quantities of special nuclear material that have more than 5 kilograms of special nuclear material as holdup on a regular basis. The method, justification, and supporting documentation should be included in the Materials Control and Accountability Plan.
    - (4) Physical Inventory Frequencies. For each facility, physical inventories shall be performed for Category I and II

Materials Balance Areas involving activities other than processing at a frequency determined by the Manager, Operations Office, but at least semiannually. For Category I and II Materials Balance Areas where processing occurs, physical inventories shall be performed at a frequency determined by the Manager, Operations Office, but at least bimonthly. Factors to be taken into consideration for frequency determination include personnel radiation exposure, the operational mode of the facility, and credible protracted diversion scenarios.

Category IV source and/or other nuclear material in Category I and II Materials Balance Areas shall be inventoried on a schedule defined by the Manager, Operations Office, but at least annually, except when the source and/or other nuclear material is a credible substitution material. In situations where substitution materials are collocated with special nuclear material, facilities shall inventory substitution materials with the same frequency as the special nuclear material and implement the use of inventory measurement methods that can distinguish between special nuclear material and source and other nuclear material.

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

For each facility, physical inventories shall be performed for Category III and IV Materials Balance Areas at a frequency to be determined by the Manager, Operations Office, but at least biennially.

For facilities having multiple Materials Balance Areas with varied inventory frequencies, a simultaneous inventory of the complete facility shall be performed at least once biennially.

- (5) Deviations to Inventory Frequencies. Deviations to inventory frequency requirements described in subparagraph (4) above may be approved in accordance with DOE 5630. 11B, for situations where alternative control mechanisms provide assurance that unreported changes in inventories would be detected. Inventory values shall be determined in time to provide for computation and reconciliation of inventories and determination of inventory differences, consistent with DOE reporting requirements stated on page II-19, paragraph 7, and approved inventory frequencies. See "Guide for Implementation of DOE 5633. 3A."

- (6) Physical Inventory Reconciliation Program. For each facility, management shall implement a physical inventory reconciliation program designed to provide assurance that all nuclear material has been accounted for and that the facility's record system reflects the physical inventory. Upon completion of the physical inventory, the book inventory for each Materials Balance Area shall be compared with and, if necessary, adjusted to the physical inventory.
- b. Special Inventories. At each facility, management shall establish and implement procedures for conducting special inventories as a result of routine disassembly of critical assemblies, changes in custodial responsibilities, missing items, inventory differences exceeding established control limits, abnormal occurrences, or at the request of authorized facility personnel or the cognizant Operations Office.
- c. International Atomic Energy Agency Inventories. Physical inventories performed during International Atomic Energy Agency inspections may, with the concurrence of the Manager, Operations Office, serve in place of a scheduled physical inventory.
- d. Inventory Verification/Confirmation Measurements.
  - (1) At each facility, management shall establish and implement a system for performing measurements as part of a physical inventory. Verification measurements shall be made on special nuclear material items that are not tamper-indicating. Confirmation measurements shall be made on items that are tamper-indicating. Such measurements are intended to detect diversion or theft of material and shall use a statistically-based sampling plan applied in a manner consistent with the graded safeguards concept. Separate sampling plans shall be implemented for verification and confirmation measurements to assure that a sufficient number of non-tamper-indicating items are measured. Parameters for statistical sampling plans and inventory stratifications used with statistical sampling plans shall be defined by facility management and approved by the Manager, Operations Office. The Manager, Operations Office, may establish a material quantity threshold for requiring inventory verification/confirmation measurements. It is recognized that certain materials are not amenable to verification measurements. Such materials shall be documented in the Materials Control and Accountability Plan and, for these materials, confirmatory measurements of two material attributes may be substituted for the verification measurement. Materials not amenable to measurement shall be identified as on page 11-6, paragraph 4.
  - (2) Documented acceptance/rejection criteria for inventory confirmation/ verification measurements shall be established based on valid technical and, where technically feasible, on valid statistical principles. For Category I and II items,



acceptance/rejection criteria shall be consistent with performance requirements for confirmation/verification measurements stated in Figure I-4, page I-12. A response plan shall be prepared and implemented for evaluating and resolving all verification/confirmation measurements that fail acceptance criteria. Items that fail the confirmation/verification measurement criteria shall not be processed prior to resolution of the discrepancy. Performance requirements for inventory confirmation/verification measurements are contained on page I-10, paragraph 4.

4. MEASUREMENTS AND MEASUREMENT CONTROL. At all facilities possessing nuclear material, measurement and measurement control programs shall be implemented. The object of measurement and measurement control is to establish nuclear material values and to assure the quality of the data. Measurements programs used to determine Category I or II inventories of special nuclear material or used to determine a Category I or II special nuclear material throughput over a 6 month period shall address the topics identified in this paragraph and shall be consistent with facility-specific measurement program objectives. For other measurement and measurement control programs (those used only to determine Category III or IV inventories), the scope and content of the programs shall be approved by the Manager, Operations Office. For Category I and II facilities, these programs shall address the topics identified in this paragraph and shall be consistent with facility-specific measurement program objectives.

Materials not amenable to measurement by the site shall be identified in the facility's Materials Control and Accountability Plan. Inventory values for these materials shall be based on measured values made at other sites or technically justified estimates. Justification and supporting documentation for these inventory values shall be included as part of the Materials Control and Accountability Plan.

Additional guidance on measurement control is provided in the DOE "Measurement Control Guide," (3-93).

- a. Organization. The measurement and measurement control program shall be organized to facilitate efficiency of operation and quality of performance and be independent from operations.
- b. Selection and Qualification of Measurement Methods. The objective is to ensure that measurement methods selected for use are capable of measuring the material in question to the desired levels of precision and accuracy, as approved by the Manager, Operations Office, and consistent with a graded safeguards approach. To this end, each facility's management shall select, qualify, and validate measurement methods capable of providing the desired levels of precision and accuracy. Selection and qualification of a measurement method shall be the responsibility of the facility management. Target values for the accuracy and precision of nuclear material measurements recommended and endorsed by recognized national and international nuclear organizations may be

used by contractors and Operations Offices as guidance for desirable levels of accuracy and precision. The Manager, Operations Office, shall review the documentation of this process and shall approve the precision and accuracy goals. Each facility shall have procedures to ensure that only qualified measurement methods are used for accountability purposes.

- c. Training and Qualification of Measurement Personnel. The objective is to assure that the individuals responsible for performing measurements have sufficient knowledge to perform the measurements in an acceptable manner.

- (1) Training. Each facility shall have a documented plan for the training of measurement personnel. The plan shall be reviewed annually and updated as necessary to reflect changes in measurement technology and shall specify training, qualification, and requalification requirements for each measurement method.
- (2) Qualification. Each facility shall have a documented qualification program that ensures that measurement personnel demonstrate acceptable levels of proficiency before performing measurements, and that measurement personnel are requalified according to requirements in the training plan. For destructive analysis of nuclear material, this proficiency shall be demonstrated, at a minimum, once per day for each method that the individual will use that day.

- d. Measurement Systems. The objective of the measurement system is to provide nuclear material values for inventories and transactions.

- (1) Sampling. The objective of the sampling program is to ensure that the small portion of bulk material taken for measurement is representative of the bulk material. Each facility shall have documented sampling plans for each measurement point used for accountability purposes. The plans shall be based on valid technical and statistical principles and shall take into account material type, measurement requirements, and any special process or operational considerations.
  - (a) The basis of the sampling plan shall be documented and validated through studies of the materials or items being sampled.
  - (b) The sampling plan shall specify at a minimum the sampling procedure, number of samples required, size of samples, mixing time and procedure (when applicable), provisions for retaining archive samples, and estimates of variance associated with the sampling method.

- (c) Sampling procedures shall be documented and reviewed annually or whenever changes are made to the sampling process or in material type or composition of the material being sampled.
- (2) Measurement Methods. For each facility, measurement methods shall be developed, documented, and maintained for all nuclear material on inventory except for those materials not amenable to measurement. These methods shall be written to provide clear direction to the analyst or operator, and shall be validated initially and revalidated whenever changes are made.
  - (a) In determining inventory values and consistent with the graded safeguards concept, the selection of the measurement methods shall assure that the contribution of the measurement error to the uncertainty of the inventory difference is minimized.
  - (b) Verification measurements, when used to adjust accountability records, shall have accuracy and precision comparable to, or better than, the original measurement method.
  - (c) For confirmatory measurements, the measurement method used shall be capable of determining the presence or absence of a specific attribute of the material, consistent with valid acceptance/rejection criteria.
  - (d) All measurement methods shall be calibrated using Standard Reference Materials, Certified Reference Materials, or secondary standards traceable to the national measurement base, and revalidated as necessary.
  - (e) Equipment and instrumentation used in performing measurements shall meet precision and accuracy requirements under in-plant conditions.
  - (f) Documentation of measurement data shall be maintained to provide an audit trail from source data to accounting records.
- e. Measurement Control. The objective of measurement control is to assure the effectiveness of measurement systems and the quality of measured values used for accountability purposes and to obtain precision and accuracy values for use in the determination of inventory difference control limits and shipper/receiver limits of error.
  - (1) Measurement Control Programs. For each facility, measurement control programs shall be developed and implemented for all measurement systems used for accountability purposes. A measurement control program, as

referred to herein, shall include at a minimum the following elements:

- (a) Scales and Balances Program. All scales and balances used for accountability purposes shall 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.
- (b) Analytical Quality Control. Data from routine measurements shall be analyzed statistically to determine and ensure accuracy and precision of the measurements.
- (c) Sampling Variability. The uncertainty associated with each sampling method, or combination of sampling and measurement method, shall be determined and maintained on a current basis.
- (d) Physical Measurement Control. The precision and accuracies of volume, temperature, pressure, and density measurements shall be determined and assured.
- (e) Instrument Calibration. Instrumentation shall be calibrated using appropriate standards, when available, or at a minimum, measurement values shall be compared with more accurate measurement systems values on a prescribed basis, with the frequency being defined by demonstrated instrument performance.
- (f) Reference Materials (Standards). All calibration and working standards used in a measurement control program shall be traceable to the national measurement base through the use of standard reference materials or certified reference materials and shall 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 shall be representative of the type and composition of the material being measured when the material matrix affects the measured values. For additional information see "Guidance on Meeting DOE Order Requirements for Traceable Nondestructive Assay Measurements."
- (g) Sample Exchange Programs. Each facility's measurement control program shall include participation in appropriate interlaboratory control programs to provide independent verification of internal analytical quality control.

- (h) Statistical Controls. For each measurement method used for accountability purposes, control limits shall be calculated and monitored, and documented procedures shall exist to correct out-of-limits conditions. Control limits shall be established at the two sigma level (warning limits) and three sigma level (alarm limits). Control data exceeding the two sigma limits shall be investigated, and, when warranted, timely corrective action shall be taken. Whenever a single data point exceeds the three sigma level, the measurement system in question shall 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 shall include uncertainties for each analyst/method combination. Statistical control limits shall be monitored to assure that they are consistent with target values agreed to by the facility management and the Manager, Operations Office.
  - (i) Measurement Method Qualification. Each facility shall have a documented method qualification program that ensures that a measurement method shall demonstrate acceptable performance before being used for performing accountability measurements. For destructive analysis and nondestructive assay of nuclear material, this performance shall be demonstrated, at a minimum, once per day that each method is used. For nondestructive analysis measurement systems where meeting this requirement is impractical or unnecessary, the control measurement frequency shall be at least one of every five measurements, unless otherwise approved by the Manager, Operations Office.
  - (j) Measurement Control Procedures. Documented measurement control procedures shall be developed at each facility for all measurement methods used for accountability, and each facility shall have a program to assure that measurement control procedures are followed.
- (2) Statistical Programs. Each facility shall have a documented program for the statistical evaluation of measurement data for determining control limits, calibration limits, and precision and accuracy levels for each measurement system used for accountability. The objective is to ensure the quality of measurement and measurement control data and to provide estimates of uncertainty on inventory and inventory control statements. The program, at a minimum, shall contain the following elements:

- (a) Valid statistical techniques to determine the total random error and the measurement biases generated for each measurement system or sampling/measurement system, and to determine control limits, rejection limits, and outlier criteria.
  - (b) A valid statistical technique to develop sampling plans for inventory and measurement of nuclear material.
  - (c) Analyses 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. MATERIAL TRANSFERS. Each facility shall have a program to control and account for internal and external facility transfers of nuclear materials. This program shall include documented procedures that specify requirements for authorization, documentation, tracking, verification, and response to abnormal situations that may occur during transfer of nuclear materials. For additional details, see page II-19, paragraph 7. Page II-19, paragraph 7, provides specific directions for preparing and submitting DOE/NRC F 741, "Nuclear Material Transaction Report," and DOE forms required for documenting external transfers for materials accounting purposes.
  - a. External Transfers.
    - (1) The shipper shall 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 different Reporting Identification Symbols shall be documented on DOE/NRC F 741. These shall be prepared and distributed to the principals of the transaction and the cognizant Operations Office, preferably on the day of the transfer but within 24 hours, or on the first workday after the transfer should it occur on a nonworkday. However, Managers, Operations Offices, may direct DOE contractors to discontinue the routine distribution of DOE/NRC F 741 to their offices.
    - (3) Immediately after receipt, shipments shall be subjected to a transfer check. Transfer checks shall consist of confirmation of shipping container or item count, validation of tamper-indicating devices integrity and identification, and comparison with shipping documentation to provide assurance that the shipment was received intact. For purposes of transfer checks, receipt occurs whenever the transfer vehicle is unloaded or the transfer vehicle's integrity is breached (tamper-indicating devices removed or

broken) at the receiving facility. Documented procedures shall specify actions to be taken in the event discrepancies are detected. Records of transfer checks shall be maintained and subjected to audit and shall be retained at least until the next annual DOE safeguards survey. (For accountability purposes, material in transit at the end of a reporting period shall be included in the receivers reported inventory, even though physical receipt of the material has not yet occurred.)

- (4) All unirradiated Category I and II quantities of special nuclear material transferred between facilities having different reporting identification symbols shall have independently measured values determined by the shipper and receiver except when the Reporting Identification Symbols are both located on the same site and have the same site contractor. The Manager, Operations Office, may require measured values for other categories of nuclear material transfers, consistent with the strategic and/or monetary value of the material, or as required for environmental, safety, and operational controls. Material received shall not be put into the process prior to completion of required accountability measurements, unless a deviation is approved or the criteria defined on page II-15, paragraph 5a(4)(g), apply. When accountability measurements are required and materials are to be put in the process prior to making the accountability measurements, an agreement should be reached between the shipper and receiver as to how significant shipper/receiver differences will be handled.
  - (a) The shipper shall independently determine the measured values prior to shipment unless the integrity of the item and of the existing measured values have been assured. The shipper's measured values shall be documented on DOE/NRC F 741 and DOE/NRC F 741A, if applicable.
  - (b) Receiver's accountability measurements for Category I and II quantities of special nuclear material transfers shall be accomplished in accordance with the requirements contained in Figure II-1. Receiver's accountability measurements for transfers involving other categories of nuclear material, where required by the Manager, Operations Office, (see paragraph 5a(4)), shall be performed in accordance with the requirements shown in Figure II-1. The Manager, Operations Office, may require that precision and accuracy goals be met for measurement of shipments and receipts. If receiver's accountability measurements cannot be accomplished consistent with requirements in Figure II-1, then confirmatory measurements as outlined in paragraph 5a(4)(f) below apply.

- (c) Shipper's values may be entered into the receiver's accountability records for nuclear material transfers when the shipper's values are more accurate than those which can be reasonably obtained by the receiver. However, the receiver must perform an accountability measurement within the timeframe specified in Figure II-1 to maximize loss detection sensitivity.

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

Figure II-1  
Shipper/Receiver Measurement Requirements

- (d) For shipments of unirradiated special nuclear material containing greater than 250 grams of a single special nuclear material type and for each discrete item exceeding 250 grams, limits of error at the 95 percent confidence level shall be assigned to their measurements by the shipper/receiver, for both the

<sup>1</sup> Material Confirmation. Confirmatory measurement by nondestructive analysis and gross weight check and item count (if not done in transfer check). Confirmatory measurements are not required for all materials. Where confirmatory measurements are required, they shall be performed within the timeframes of this table. Amounts less than 50 grams fissile may be accepted at shipper's values.

<sup>2</sup> Accountability Measurements. Quantitative determination of material quantities (generally within designated measurement uncertainty limits); resultant measurement values are entered into receiver's accountability records with the exception of those materials described in paragraph 5a(4)(c) above and 5a(4)(g), page II-15. Accountability measurements are not required for all materials. Where accountability measurements are required, they shall be performed within the timeframes of this table. Amounts less than 50 grams fissile may be accepted at shipper's values.



element and isotope values. Limits of error need not be reflected on the DOE/NRC F 741 for external transfers for which verification measurements cannot be performed (refer to paragraph 5a(4)). 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) Shippers and receivers shall provide a system for performing confirmatory measurements on external transfers of special nuclear material. Whenever accountability measurements cannot be performed within timeframes specified in Figure II-1, confirmatory measurements are required for all transfers of Category I and II special nuclear material and for any other materials for which the Manager, Operations Office, requires shipper/receiver accountability measurements. Documented acceptance/rejection criteria, based upon valid statistical principles, shall be established and used to evaluate confirmatory measurement data. A response plan for investigation and resolution of confirmatory measurements that fail acceptance criteria shall be developed and implemented; all outliers shall be investigated and resolved.
- (f) Where delays in completion of the receiver's measurement will result in a protracted delay in closure of the transaction, a confirmatory measurement may be used to effect a "safeguards closure" of the transaction, and documented by an "A-B" entry on the DOE/NRC F 741 and DOE/NRC F 741A, if required. Such a safeguards closure may be used when the integrity of the shipment is assured, and only accountability measurement differences are possible between shipper and receiver. When the receiver's accountability measurement performed subsequent to a safeguards closure indicates a shipper/receiver difference, the difference may be resolved by mutual agreement of the Managers of shipper's and receiver's Operations Offices, with an adjustment (correcting entry) to the DOE/NRC F 741 and/or DOE/NRC F 741A, if required. The safeguards closure may be applied only when all of the following conditions are met:
  - 1. No discrepancies are found in the verification of the piece count, identification number and integrity of the tamper-indicating devices, and gross weight of the items or containers received, and there is no evidence indicating theft or diversion of the material.

- 2 The shipper's and receiver's confirmation measurements are performed using "comparable" methods and the results of the measurements are within the established limits of agreement. The term "comparable" here means that the methods measure the same nuclear material attribute and the results of the methods-can be compared on a technically valid basis.
  - 3 A shipper/receiver agreement, approved by both Managers, Operations Offices, is in effect for the transaction, establishing the criteria for closing transactions based on confirmatory measurements.
- (g) Limited processing is acceptable for certain materials not amenable to non-destructive assay in order to perform a receipt measurement, as approved by the Managers of shipper's and receiver's Operations Offices with Office of Safeguards and Security concurrence. Limited processing can include homogenization and dissolution. Materials not amenable to measurement shall be identified in the facility's Materials Control and Accountability Plan.

b. Internal Transfers.

- (1) Each facility's management shall provide a graded system of measurements and records to reflect the flow of material between Materials Balance Areas within that facility and between it and other facilities on the same site.
- (2) The facility control system shall be designed to monitor transfer activities and to deter and/or detect unauthorized removal of material during transfers. The system should flag abnormal situations, e.g., when inappropriate transfers of quantities and/or materials are made, when unauthorized personnel receive or ship materials.
- (3) Transfers shall be documented on nuclear material transfer forms, or an electronic equivalent, that contain required information, are prepared and distributed within established timeframes, and are signed by authorized custodians or their alternates.
- (4) Materials shall be subjected to a transfer check within one workday after receipt. These checks shall include verification of shipping container or item count, tamper-indicating devices integrity, and identification number. These transfer checks shall be compared to appropriate documentation. All irradiated special nuclear material requires only a transfer check.

- (5) If the isotope content of special nuclear material (excluding uranium enriched below 20 percent U-235) transferred between Materials Balance Areas is 50 grams (fissile) or more, the transfer shall be measured, or a confirmatory measurement made, by the receiver. Measurements are not required for transfers that:
- (a) Consist of assembled components in which the special nuclear material is physically inaccessible;
  - (b) Are sent to laboratories or nondestructive analysis measurement areas for analysis or examination under conditions which provide adequate internal controls to maintain a continuous awareness of the location and integrity of the special nuclear material until it is returned;
  - (c) Are tamper-safed and contain only Category III or IV quantities of material; or
  - (d) Consist entirely of small items containing less than 25 grams each and for which unauthorized accumulation of a Category III quantity of material is not credible. Measurements shall be accomplished in accordance with the schedules shown in Figure 11-1. Materials not amenable to measurement may be subject to measurement requirements in accordance with paragraph 5a(4)(g).
- (6) Documented acceptance/rejection criteria shall be established and used to evaluate measurement data for internal material transfers. In addition, procedures shall specify notification and response requirements if material removal or another abnormal situation is detected. These requirements shall be consistent with page 1-13, paragraph 5, and DOE 5000.3B.

6. MATERIAL CONTROL INDICATORS. Each facility's management shall implement a program for assessing the material control indicators described below in order to provide assurance that losses and unauthorized removals of nuclear materials are detected. Each facility shall have documented plans specifying responsibilities and providing procedures for evaluating material control indicators.

a. Shipper/Receiver Difference Assessment. Each facility shall have written procedures 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:
- (a) It involves a discrepancy in the number of items regardless of the quantity of nuclear material;

- (b) It is statistically significant. (Determination of whether shipper/receiver difference are statistically significant is only required for those shipments for which 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's and receiver's measured values; or
  - 2 The square root of two (approximately 1.4) times a single valid limit of error when either the shipper's or receiver's limit of error is not valid. (When both shipper's and receiver's limits of error are determined not to be valid, the limits of error must be recalculated and the statistical significance of the shipper/receiver difference must be reevaluated.)
- (2) Shipper/receiver difference data shall be subjected to trend analysis to detect measurement bias and/or material loss. Analyses shall be designed to detect statistically significant cumulative shipper/receiver differences and to trigger investigations whenever these differences are detected.
- (3) The receiver shall notify its Operations Office and the shipper of any shipper/receiver difference determined to be significant. Both shipper and receiver shall investigate their measurements and limits of error. Such investigations shall be completed within 30 working days after the receiver's accountability measurements unless a time extension is granted by mutual agreement of the involved Managers, Operations Offices. All investigations shall be documented.
- (4) Significant shipper/receiver differences involving a discrepancy in the number of items shall be reported in accordance with DOE 5000.3B and the requirements contained on page I-13, paragraph 5.
- (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 each party shall record its own quantitative value. For the purposes of this paragraph, differences of less than 50 grams fissile or less than 5 grams of tritium are considered to be insufficient to

require an investigation unless there are special circumstances. The authority to invoke the stipulations of this paragraph shall rest mutually with the Managers of the shipper's and receiver's Operations Offices.

- (6) Resolution of statistically significant shipper/receiver differences may be achieved through any of the following:
  - (a) If both shipper's and receiver's Operations Office obtain adequate assurance that the measurements and limits of error are valid, and the investigation indicates that theft or diversion has not occurred, then each facility shall record its own quantitative values; or
  - (b) If either the shipper or receiver agrees to accept the other's value, then the shipper or receiver shall prepare a corrected copy of the shipping document using the other's data; or
  - (c) If the results of the investigations do not result in a satisfactory resolution, the Office of Safeguards and Security shall arbitrate the matter and recommend the action to be taken; or
  - (d) In the case where contracts specify other procedures for arbitration, they shall prevail.
- (7) The receiving facility shall not process special nuclear material contained in a shipment involving an unresolved significant shipper/receiver difference unless a shipper/receiver agreement allowing this has been approved by both the Managers of the shipper's and receiver's Operations Offices.

b. Inventory Difference Evaluation.

- (1) Each facility shall have a documented program for evaluating all special nuclear material inventory differences, including those involving missing items. Programs for evaluation of inventory differences for other nuclear materials may be established at the option of the Manager, Operations Office. Procedures shall be provided for establishing control limits and requiring investigation when those limits are exceeded. Warning limits will be set at the 95 percent confidence level. Alarm limits will be set at the 99 percent confidence level. All inventory differences exceeding warning or alarm limits shall be reported in accordance with DOE 5000.3B and page I-13, paragraph 5. Assessments of inventory differences shall include statistical tests (e.g., tests of trends and biases), and shall be applied, as appropriate, to both total

inventory difference and actual inventory difference on an individual and cumulative basis for each processing Materials Balance Area.

- (2) Procedures for establishing control limits for inventory differences shall be based on variance propagation using current data. The data should reflect operating conditions for the material balance period of the inventory. Alternatively, other statistically-valid techniques may be used but must be justified on the basis of factors such as limited data, low transfer rates, categories, and major process variations. The methodology shall be approved by the cognizant Manager, Operations Office. Historical inventory difference data shall be evaluated for comparison with the statistically based limits, where applicable. Where the propagated or otherwise statistically based methods do not yield control limits consistent with historical data, efforts shall be made to resolve the discrepancies between the two.
- (3) Each facility shall have documented procedures for responding to and reporting missing items and inventory differences in excess of control limits. The reporting and investigation of inventory differences shall be consistent with the requirements specified on page 1-13, paragraph 5.

c. Evaluation of Other Inventory Adjustments.

- (1) Each facility's management shall establish a documented program for evaluating all inventory adjustments entered in the accounting records. The program shall include 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. Procedures shall be outlined for the statistical review of inventory adjustments using techniques such as tests of trends, biases, and correlation.
- (2) Procedures shall be implemented to assure that all inventory adjustments are supported by measured values or other technically justifiable bases. The program shall include procedures for measuring/monitoring environmental waste such as stack effluents and liquid waste streams as required by DOE 5400.1, GENERAL ENVIRONMENTAL PROTECTION PROGRAM.
- (3) Procedures shall be established for reporting reviews of inventory adjustments, including abnormal situations, to the Manager, Operations Office.

7. DOCUMENTATION AND REPORTING. This paragraph establishes the policies for the documentation of nuclear materials transactions, preparation of periodic summaries and reports concerning the status of nuclear materials held in inventory, reporting of nuclear materials transactions, material balances, and other required inventory data to the Nuclear Materials

Management and Safeguards System and establishes the basis for DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION which provides required procedures for reporting and data submission.

Departmental Elements and contractors shall document all nuclear materials transactions, material balances, and inventories in accordance with the instructions provided in DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION, and shall transmit this information to the national database, Nuclear Materials Management and Safeguards System.

The national database is used to accumulate and distribute information concerning nuclear materials transactions and inventories. The objective of the system is to achieve reporting of accurate and complete data as soon as possible after the events described by the data occur.

The national database shall provide nuclear materials information relating to safeguards, materials management and production, inventory quantities and valuations, and other programs requested or required by DOE or Nuclear Regulatory Commission.

The national database shall serve as the centralized reporting facility to provide the information required under the provisions of the U.S./International Atomic Energy Agency Safeguards Agreement.

- a. Forms. Those forms identified and described in the DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION (or an equivalent form approved by the cognizant field element) shall be used for the documentation and reporting of nuclear materials transactions, material balances, and inventories in accordance with the instructions provided. A computer-generated or other approved equivalent must contain all information necessary for proper documentation and reporting of nuclear materials transactions, material balances, and inventories, as appropriate. The forms may be obtained through the DOE Oak Ridge Operations Office, Materials Control and Accountability Branch.
- b. Procedures and Requirements.
  - (1) In addition to the instructions provided in this paragraph, specific procedures for completing each data processing form, and for submitting the data to the national database are contained in the DOE 5633.3B GUIDE OF IMPLEMENTATION INSTRUCTIONS FOR NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM REPORTING AND DATA SUBMISSION.
  - (2) Documentation of Transactions.
    - (a) General.

1. Manual Method. All transfers of reportable quantities of nuclear material (see Figure I-1,

page I-2) between organizations with different reporting identification symbols within the U.S., or between facilities in the U.S. and foreign entities, shall be documented on a Nuclear Material Transaction Report (DOE/NRC F 741 and DOE/NRC F 741A, if required). The procedures and requirements for documentation of transactions assure that accountability for nuclear materials is transferred from shipper to receiver.

- 2     Automated Method.    Consenting Heads of Field Elements may elect to have transaction data automated and transmitted over appropriate telecommunications systems; thus eliminating the manual preparation of the required forms. If this method is used, all procedures and instructions of this Order shall apply except that signatures on the transaction documents no longer shall be necessary. Internal controls shall assure that the data transmitted have been properly authorized. The sender and recipient of such automated messages shall produce hard copies of the messages for use by all parties needing copies. The hard copies shall contain the information normally included on DOE/NRC F 741 and DOE/NRC F 741A, if required. The automated method of handling and transmitting transfer data shall follow all requirements of the Code of Federal Regulations (see Attachment 1) for activities involving Nuclear Regulatory Commission or "Agreement State" licensees (i.e., commercial waste management sites and those parties with Reporting Identification Symbols beginning with the letters "X" through "Z").
- 3     Either Method.    Material types, elements, and isotopes to be reported, and their respective reporting units, shall be as specified in Figure I-1. For each detail line of shipper/receiver data shown on DOE/NRC F 741 and DOE/NRC F 741A, if required, material quantities reported by assay may be summarized, but only within the individual assay ranges (e.g., for enriched uranium, within 10.00 to 20.00% U-235 or within 80.00 to 92.00% U-235, as appropriate) required for reporting the Composition of Ending Inventory. Supporting documentation shall be attached to indicate individual quantities that have been summarized. Nuclear material transactions between facilities by both the automated and the manual method are required to



have signatures on the transaction documents, however, signatures can be on either the automated or the manual copy.

- 4 Agreement of Transaction Data. Data sent to the national database shall agree, on a line-for-line basis, with data sent to the shipper or receiver party to the transaction on DOE/NRC F 741, or automated equivalent.

(b) Types of Transfers.

- 1 Physical Transfer of Material. The shipper shall either include copies of the transfer report intended for the receiver with each shipment, or dispatch the receiver's and other copies of DOE/NRC F 741 and DOE/NRC F 741A, if required, by other means no later than 1 workday following shipment of the material. The receiver shall prepare and distribute the receiver's sections of DOE/NRC F 741 and DOE/NRC F 741A, if required, no later than 10 calendar days following receipt of the material. Whenever a facility transfers material to a foreign entity, the shipper shall include with the shipment a copy of DOE/NRC F 741 and DOE/NRC F 741A, if required, containing the shipper's data and special preprinted version of the Concise Note, and shall prepare and distribute the receiver's sections of DOE/NRC F 741 and DOE/NRC F 741A, if required, within 1 workday of receipt of the necessary data. Additional guidance may be provided by the shipper's field element. Whenever a facility receives material from a foreign entity, the receiver shall prepare and distribute the shipper's sections of the form, or approved equivalent, no later than 3 workdays following receipt of the material. In those cases where the receiver uses DOE-284, "Nuclear Material Transfer Receipt," as an interim document to acknowledge receipt of nuclear materials pending independent determination of material content, DOE-284 shall be prepared and distributed within 10 calendar days following receipt of the material. If a DOE-284 is submitted, the receiver shall prepare and submit DOE/NRC F 741 and DOE/NRC F 741A, if required, within 1 workday after the receiver's measurement has been obtained. Transfers involving Department of Defense, except for transfers of nuclear material in Navy cores and associated items, shall be documented in

accordance with the instructions provided, as supplemented by the Albuquerque Operations Office.

- 2 Nonphysical Transfer of Material. DOE/NRC F 741 and DOE/NRC F 741A, if required, or an approved equivalent shall be used to record a change in project number, ownership status, or financial responsibility.
- 3 Other Types of Receipts and Removals. Various other types of receipts and removals including, but not limited to: production, transfers to and from other materials, sales, decay, losses and other inventory changes including inventory differences, shall be documented by using DOE/NRC F 741 and DOE/NRC F 741A, if required, or an approved equivalent. Such other types of receipt and removal data involving reportable quantities shall be documented and reported consistent with b(4)(a) and (e), page II-27.

(c) Special Requirements.

- 1 Notifying Receiver of Nuclear Material Shipments. Each shipper shall be responsible for advising the intended receiver of proposed shipments of nuclear material and for providing all pertinent advance information. Specific notification requirements applicable to individual facilities are contained in the "DOE Directory of Reporting Identification Symbols."
- 2 Reporting of Material in Transit for Domestic Shipments.
  - a The shipper shall provide all pertinent quantity information to the receiver for all material in transit at the end of a reporting period. This requirement may be satisfied through the use of automated telecommunications methods only if both shipper and receiver possess the necessary automated capabilities.
  - b Reportable quantities of radioactive decay shall be reported to the national database by the shipper and receiver.
- 3 Tracking of Material Within the United States. Each facility shall submit country control number information in accordance with instructions provided.

4 Reporting Units and Rounding.

- a Reporting Units. Element and isotope weight shall be reported in the metric weight units specified for each material type in Figure 1-1, page 1-2.
- b Rounding Policy. The quantity being transferred shall be reported as shown in Figure 11-2, with fractions of 1/2 or greater rounded upwards and fractions of less than 1/2 dropped. Supporting documentation shall be attached to clearly indicate any rounding bias in the total material weight.
- c A transfer of multiple discrete items of 0.5 of a reporting unit or less, but of the same material type, shall be summed to a total weight of that material type before applying the criteria of Figure 11-2.

QUANTITY (When Rounded)	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.	Documentation not required on DOE/NRC F 741/741A.

Figure 11-2  
Reporting of Nuclear Material Quantities Transferred

- 5 Limits of Error on Transfers of Special Nuclear Material and Tritium. DOE contractors shall determine and notify DOE of limits of error on transfers of special nuclear material and/or tritium (except in the case of tritium in reservoirs), as specified on page 11-11, paragraph 5. Such notification shall be made using DOE/NRC F 741 and DOE/NRC F 741A, if required, or an approved equivalent. Limits of error shall be stated on all copies of DOE/NRC F 741 and DOE/NRC F 741A, if required. The requirements for limits of error as contained in the Code of Federal Regulations (10 CFR 70.58 (e)) also apply.

- 6      Amendments or Adjustments to Previously Issued DOE/NRC F 741 and/or DOE/NRC F 741A. When an adjustment is made by one party to a transaction, DOE field elements shall assure that contractors under their jurisdiction document the adjustment on DOE/NRC F 741 and/or DOE/NRC F 741A, if required, and transmit the completed form to the other party to the transaction within 24 hours, or by the close of the first business day after obtaining the adjustment data.
- 7      Transfers of Nuclear Material Between DOE Contractors and Licensees.

  - a      Transfers to Licensees. DOE contractors who receive authorizations and requests for distribution of nuclear material to a licensee, pursuant to 42 U.S.C. §§2073, 2093, and 2111 (as amended), shall document such transfers using DOE/NRC F 741 and DOE/NRC F 741A, if required.
  - b      Transfers from Licensees. Transfer documents for nuclear material shipped to DOE for credit or service by a licensed facility are prepared and distributed by the shipper in accordance with the requirements of the Code of Federal Regulations. When such material is received it shall be documented by the receiver using DOE/NRC F 741 and DOE/NRC F 741A, if required.
- 8      Transfers of Nuclear Material Between the United States and Foreign Nations, Foreign Regional Organizations, or Supranational Organizations.

  - a      General. Foreign nations, foreign regional organizations, supranational organizations, foreign facilities (hereinafter referred to collectively as "foreign entities") may receive or return U.S. Government-owned or privately owned nuclear material, as applicable, obtained by sale, lease, grant, donation, or loan from DOE contractor facilities, or Nuclear Regulatory Commission or "Agreement State" licensees, pursuant to 42 U.S.C. §§2074 (as amended), 2094 (as amended), 2112, or 2121 (c).

- b Documentation of Transfers. Transfers of nuclear material to and from foreign entities shall be documented using DOE/NRC F 741 and DOE/NRC F 741A, if required.
- (3) Material Balance Report. Nuclear material balances shall be documented and reported in accordance with the instructions provided.
- (a) Material balance reports shall be submitted on or in the format of DOE/NRC F 742, "Material Balance Report."
  - (b) A single material balance report shall be prepared for each material type to document the beginning and ending inventories, and all receipts and removals of nuclear material relevant to the reporting identification symbol being reported on by each facility. Inventory and transfer data shall be reported for all nuclear material, regardless of whether the material is held pursuant to a DOE contract, under private ownership, or under the provisions of 42 U.S.C. §§2073, 2074, 2093, or 2094 (as amended).
  - (c) Material types, elements, and isotopes to be reported, and their respective reporting units, shall be as specified in Figure I-1, page I-2. Each quantity shown on DOE/NRC F 742 shall be rounded to the proper whole reporting unit for the material type.
  - (d) Adjustments, amendments, or corrections to reports shall be made according to the instructions provided.
  - (e) Radioactive decay shall be reported on material balance reports on a quarterly basis when the decay has reached accountable quantities or at a more frequent reporting interval if required by the cognizant Operations Office.
  - (f) DOE F DP-742B, "Material Activity Schedule," shall be submitted in addition to the material balance report by facilities with reporting identification symbols beginning with the letters "A" through "QAA," if applicable. DOE F DP-742B shall be used for reporting information on DOE-owned loaned/leased nuclear material held for the account of another reporting identification symbol.
  - (g) Material balance reports shall be submitted:
- 1 Semiannually as of March 31 and September 30, for all facilities; monthly or quarterly when directed by the cognizant field element.

- 2 As Specified in facility attachments or transitional facility attachments for DOE facilities selected under the provisions of the U.S./International Atomic Energy Agency Safeguards Agreement.
  - 3 In Lieu of the Above, field element managers may request that the national database produce computer-generated material balance reports. After receipt of all necessary data, such reports shall be sent promptly to the concerned facilities. The facilities shall review the reports for content, note thereon any changes that are warranted, and sign and distribute the reports.
- (h) Material in transit at the end of a reporting period shall be reported as if received within the reporting period by the intended receiver.
- (4) Inventory Reporting.
- (a) All inventories of nuclear material shall be reported to the national database on DOE F DP-733, "ADP Transcription Sheet for Inventory Data," DOE F DP-733A, "ADP Transcription Sheet for Inventory Data," or DOE/NRC F 742C, "Physical Inventory Listing," as appropriate.
  - (b) Material types, elements, and isotopes to be reported, and their respective reporting units, shall be as specified in Figure I-1, page I-2. Each quantity shown on DOE F DP-733, DOE F DP-733A, and DOE/NRC F 742C shall be rounded to the proper whole reporting unit for the material type.
  - (d) Inventory reports shall be submitted:
    - 1 Quarterly, as of December 31, March 31, June 30, and September 30 for all facilities; monthly when directed by the cognizant field element.
    - 2 As Specified in facility attachments or transitional facility attachments for DOE facilities selected under the provisions of the U.S./International Atomic Energy Agency Safeguards Agreement.
  - (e) Material in transit at the end of a reporting period shall be included in the receiver's reported inventory as if received by the intended receiver within the reporting period.

(5) Data Processing Procedures.

- (a) Transaction Data shall be submitted to the national database, using DOE F DP-740, "ADP Transcription Sheet Nuclear Material Transaction Journal," and DOE F DP-740A, "ADP Transcription Sheet Nuclear Material Transaction Journal," as soon as possible after the transaction occurs, but no less often than weekly. Data on all transactions occurring during a calendar month shall be submitted no later than 8 working days following the end of the month during which the transactions occurred.
- (b) Inventory Data shall be submitted to the national database using DOE F DP-733, or for the facilities selected under the provisions of the U.S./International Atomic Energy Agency Safeguards Agreement, using DOE F DP-733A, as appropriate. Inventory data shall be submitted within 15 calendar days after the end of the reporting period.
- (c) Material Balance Report Data shall be submitted to the national database using DOE F DP-735, "ADP Transaction Sheet for Material Balance Report Data," within 15 calendar days of the end of the reporting period for facilities selected under the provisions of the U.S./International Atomic Energy Agency Safeguards Agreement.
- (d) Concise Note Data shall be submitted to the national database using DOE F DP-734 "ADP Transcription Sheet for Concise Notes," at the same time as the submission of the data to which the Concise Note refers.
- (e) Inventory Difference Explanation Data shall be submitted to the national database, using DOE F DP-740, within 1 workday after the explanation data are available, but no later than 8 working days after reporting the inventory difference.
- (f) Internal Project Transfer Data (within one Reporting Identification Symbol) shall be submitted to the national database using DOE F DP-749, "ADP Transcription Sheet Internal Project Transfers," no later than 8 working days following the end of the month in which the transfer occurs.
- (g) Confirmatory Receipt Data, when reported on DOE-284, "Nuclear Material Transfer Receipt," shall be submitted to the national database using DOE DP-740, as soon as possible after receipt of the material, but no less often than weekly. Data on confirmatory receipts occurring during a calendar

month shall be submitted no later than 8 working days following the end of the month during which the transfers occurred.

(h) Alternative Data Submission Methods.

- 1 Machine-Readable Data. In lieu of the data processing forms specified, data may be submitted to the national database in machine-readable form (e.g., on diskettes or magnetic tape). Information submitted in machine-readable form shall include all data required on the appropriate form specified, and shall be in the format specified for that form by the Office of Safeguards and Security.
- 2 Use of Telecommunications. With prior approval of the Office of Safeguards and Security, data may be submitted directly via the appropriate telecommunications system network to the national database in lieu of using the forms specified. Information submitted via a telecommunications system network shall include all data required on the appropriate form specified and shall be in the format specified by the Office of Safeguards and Security.
- 3 In any case where data are submitted in machine-readable form or via a telecommunications system network, the timing requirements of paragraph (5)(a) through (g) above shall apply, as appropriate for the type of data submitted.

- (i) Correction Data. Data correcting previously submitted data found to be in error shall be submitted during the workday in which notification of the error is received.



## CHAPTER III

### MATERIALS CONTROL

1. GENERAL. This chapter describes the requirements for-material control. The chapter is subdivided into four functional performance areas: access controls, material surveillance, material containment, and detection/assessment. The graded materials control program shall be formally documented in the Materials Control and Accountability Plan. Requirements for the control of special nuclear material are stated in both DOE 5632.1C and this Order. Some requirements stated are in one Order but not both. All requirements shall be met regardless of the Order in which they appear.
2. ACCESS CONTROLS. Each facility shall have a graded program for controlling personnel access to: nuclear materials; nuclear materials accountability, inventory, and measurement data; and data generating equipment and other items/equipment where misuse or tampering could lead to compromise of the safeguards system. The graded access control system shall consider the quantity and attractiveness of the material in the area and impacts of threats, as well as other control systems that are in place and which may mitigate these threats. These access controls may range from extensive and complex access control systems for Category IA areas and materials to simple administratively controlled access systems for Category IV areas. For facilities that have Category III and IV areas containing Attractiveness Level B and C material outside of a Protected Area, the facility's management shall assure that these areas do not possess a Category I or II quantity of special nuclear material unless a vulnerability assessment demonstrates that an unauthorized accumulation of a Category I quantity of material from these facilities is not credible. Personnel security assurance programs shall be used as a component in the prevention of the theft or diversion of special nuclear material and shall be considered in assessments of vulnerability related to theft of Category I quantities of special nuclear material. Testing of access control systems and procedures shall be conducted according to testing methodology, testing frequency, and record maintenance requirements contained in DOE 5630.16A and applicable Departmental guidance. Performance requirements for access controls are contained on page I-10, paragraph 4.
  - a. Materials Access. Each facility shall have a documented program to ensure that only properly authorized personnel have access to nuclear materials. This program shall address procedures and mechanisms to detect/respond to access by unauthorized personnel. In order to minimize the potential for unauthorized access to nuclear material, the amount of material in use shall be limited to that necessary for operational requirements, and excess material shall be stored in repositories or kept in enclosures designed to assure that access will be limited to authorized individuals. See DOE 5632.1C for additional access control and storage requirements for special nuclear material and DOE M 5632.1C-1, MANUAL FOR PROTECTION AND CONTROL OF SAFEGUARDS AND

SECURITY INTERESTS, for access authorization requirements for special nuclear material categories.

- b. Data Access. Each facility shall have a graded program to assure that only authorized persons have the ability to enter, change, or access material control and accountability data and information.
  - c. Equipment Access. Each facility shall have a graded program to control access to data-generating and other equipment used in material control activities, thereby assisting in providing assurance of the integrity of equipment and data used for material control. Such equipment includes measurement equipment, data recording devices, and tamper-indicating devices. An access control program comparable to that required for classified computer systems may be required if such controls are necessary to assure the integrity of the data system.
  - d. Other Considerations. Access controls similar to those described in paragraphs 2b and c above shall be designed to protect against data/equipment falsification or manipulation and shall detect unauthorized activities during emergency or other unusual conditions.
  - e. Unclassified Computer Systems. Where materials control and accountability data and data-generating equipment involve unclassified computer systems, these systems shall meet the requirements of DOE 1360.2B, UNCLASSIFIED COMPUTER SECURITY PROGRAM.
3. MATERIAL SURVEILLANCE. Each facility's management shall establish a graded surveillance program for monitoring nuclear materials and detecting unauthorized activities or anomalous conditions and for reporting material and facility status. The objective is the detection and assessment of conditions that may adversely affect safeguards, e.g., to detect anomalies and to report alarm conditions. The surveillance program shall address both normal and emergency conditions, and shall provide for periodic testing. Testing for material surveillance systems and procedures shall be planned and documented in accordance with DOE 5630.16A. Performance requirements for material surveillance of Category I and II quantities of special nuclear material are contained on page I-10, paragraph 4.
- a. Material Surveillance Mechanisms. Specific material surveillance methodologies may include the following:
    - (1) Automated means (e.g., monitoring devices, sensors or other instrumentation) to detect anomalies and to report alarm conditions.
    - (2) Visual surveillance/direct observation (e.g., two-person rule, monitoring by external personnel) to provide assurance that only authorized activities occur and to assess special nuclear material movements or inventory status. Visual surveillance requires reasonable assurance that activities

are observable and that the observer will recognize, correctly assess and report activities that are unauthorized or are inconsistent with established safeguards requirements. There shall be documented procedures for implementing the two-person rule.

- (3) Process logs, inventory records, or other information to indicate anomalies and trigger investigatory actions.

- b. Material Surveillance Programs. Surveillance procedures shall describe the methodologies and operational/control points on which the program is based and shall provide for investigation, notification, and reporting of anomalies. Alternatives to the material surveillance requirements specified below may be approved in accordance with DOE 5630.11B for facilities that rely primarily on other materials control and accountability and/or security measures.

- (1) Category I and II. The material surveillance program for Category I and II quantities of special nuclear material shall assure that materials are in authorized locations and shall detect unauthorized material flows and transfers. Evaluations of Category I locations shall be performed to determine system capabilities to assess material losses from Materials Access Area and Protected Area boundaries. Evaluations of Category II locations shall be performed to determine system capabilities to assess material losses from the Protected Area boundary. Material surveillance procedures for all areas having Category I or II quantities of special nuclear material shall include the following:

- (a) Only appropriately authorized and knowledgeable personnel (i.e., individuals who are capable of detecting incorrect or unauthorized actions) shall be assigned responsibility for surveillance of special nuclear material.
- (b) Controls shall be sufficient to ensure that one individual cannot gain access to a secure storage area.
- (c) Procedures to ensure constant surveillance of all persons in secure storage areas (e.g., two-person rule or equivalent surveillance procedures) shall be in effect at any time the storage area is not locked and protected by an active alarm system.
- (d) Surveillance shall be sufficient to ensure that unauthorized or unaccompanied authorized personnel cannot enter the storage area undetected when the door is unlocked or open.
- (e) When two persons are assigned responsibility for maintaining direct control of the item(s) outside an

alarmed storage area within a Materials Access Area or Protected Area, either the two authorized persons shall be physically located such that they have an unobstructed view of the item(s) and can positively detect unauthorized or incorrect procedures, or there shall be a system of hardware, procedures, and administrative controls sufficient to ensure no unauthorized accumulation of a Category I quantity without timely detection.

(f) Special nuclear material in use or process shall be under material surveillance procedures, under alarm protection, or with the approval of responsible Heads of Field Elements, protected by alternative means which can be demonstrated to provide equivalent protection.

(2) Category III. The material surveillance program for Category III quantities shall assure 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. The material surveillance program for Category IV quantities shall be site-specific and approved by the Manager, Operations Office.

4. MATERIAL CONTAINMENT. Each facility shall have a documented program to provide controls for nuclear materials operations relative to Materials Access Areas, Protected Areas, Materials Balance Areas, other authorized storage repositories, and processing areas.

a. Materials Access Area and Protected Area. The facility shall have controls to assure that Category I quantities of special nuclear material are used, processed or stored only within a Materials Access Area contained in a Protected Area and that Category II quantities of special nuclear material are used, processed, or stored only within a Protected Area. The containment program shall:

- (1) Be formally documented;
- (2) Comply with the graded safeguards concept;
- (3) Identify authorized activities and locations for nuclear materials;
- (4) Identify mechanisms used to detect unauthorized activities;
- (5) Identify material types, forms, and amounts authorized to be removed from the Materials Access Area or Protected Area;
- (6) Identify containment controls for normal and emergency conditions; and

- (7) Require a periodic audit of the containment program to ensure compliance and system effectiveness.

- b. Materials Balance Area. Each facility shall have controls to ensure that nuclear materials used, processed, or stored within a Materials Balance Area are controlled in accordance with the graded safeguards concept. Additionally, these controls shall ensure that materials are removed only via authorized pathways/portals and are subject to transfer and verification procedures as identified on page II-11, paragraph 5. The controls for Materials Balance Areas shall:
  - (1) Be formally documented;
  - (2) Identify geographical boundaries and functions of the Materials Balance Areas;
  - (3) Identify material types, forms, and quantities permitted in each Materials Balance Area;
  - (4) Describe the administrative controls for each Materials Balance Area;
  - (5) Define custodial responsibilities for nuclear materials contained within a Materials Balance Area;
  - (6) Identify personnel authorized to receive/ship nuclear material;
  - (7) Identify the material flows into and out of the Materials Balance Area;
  - (8) Ensure that material transfer procedures are followed; and
  - (9) Ensure that material quantities transferred across Materials Balance Area boundaries are based on measured values consistent with page II-16, paragraph 5b(5).
- c. Storage Repositories. The facility shall have controls for nuclear materials held in storage repositories consistent with the graded safeguards concept. The controls for storage repositories are contained in DOE M 5632.1C-1.
- d. Processing Areas. The facility shall have controls for nuclear materials being used or stored in processing areas. The controls for in-process areas shall:
  - (1) Be formally documented;
  - (2) Describe activities and locations for storing material;
  - (3) Identify components used to detect unauthorized activities or conditions;

- (4) Include procedures for moving material into or out of the processing area;
- (5) Describe control procedures for both normal and emergency conditions;
- (6) Describe response actions to be taken in abnormal situations; and
- (7) Provide for audit of the processing controls on a periodic basis to assure system effectiveness.

5. DETECTION/ASSESSMENT. Each facility shall have the capability to detect and assess the unauthorized removal of nuclear materials, consistent with the graded safeguards concept. The system shall be interfaced with the facility's physical protection and other organizational systems, as appropriate, and shall be able to detect removal of special nuclear material from its authorized location (theft/diversion/errors) and provide notification to the protective force and other organizations to respond when such events are detected.

a. Tamper-Indicating Devices. The reliance on tamper-indicating devices as a safeguards measure is directly dependent on the environment in which the tamper-indicating device resides and the material being tamper-safed. Each facility shall have a documented program, administered by the materials control and accountability organization, for control of tamper-indicating devices and to assure that tamper-indicating devices are used to the extent possible to detect violations of container integrity. DOE-wide standardized tamper-indicating devices should be used when available through DOE standardized procurement (see DOE 5630.17, SAFEGUARDS AND SECURITY (S&S) STANDARDIZATION PROGRAM). Testing of tamper-indicating device integrity, location, and application and the tamper-indicating device record system shall be conducted according to testing methodology, testing frequency, and record maintenance requirements contained in DOE 5630.16A and applicable Departmental directives and guidance. Performance requirements for tamper-indicating devices are contained on page I-10, paragraph 4, of this Order. The "Safeguards Seal Reference Manual," issued by Office of Safeguards and Security, can facilitate in the selection, application, and verification of tamper-indicating devices. The tamper-indicating device control program shall specify, as a minimum, the following elements:

- (1) Acquisition/procurement/destruction;
- (2) Types of tamper-indicating devices utilized;
- (3) Assurance of unique tamper-indicating devices identification;
- (4) Storage;
- (5) Issuance;

- (6) Personnel authorized to apply, remove, and dispose of tamper-indicating devices;
- (7) Containers on which tamper-indicating devices are to be applied;
- (8) Procedures for application of tamper-indicating devices;
- (9) Frequency and method of tamper-indicating devices verification;
- (10) Response procedures for tamper-indicating devices violations;
- (11) Assurance that tamper-indicating devices cannot be reused after violation;
- (12) Frequency and method of internal program audits; and
- (13) Procedures for reporting tamper-indicating device violations.

b. Portal Monitoring. The minimum portal monitoring requirements are in DOE 5632.1C. In addition to those requirements, the detection level of the monitors shall be based upon detection of the typical special nuclear material product in the area and the credible number of removals associated with theft of a Category I quantity of material. All detectors and related calibration standards shall be maintained and controlled to ensure that portal monitors are capable of meeting detection requirements. Periodic performance testing of portal monitors shall be conducted in accordance with page I-10, paragraph 4b. Planning and documentation of performance testing shall meet the requirements of DOE 5630.16A. Performance requirements for portal monitors (both special nuclear material and metal) are contained on page I-10, paragraph 4. Controls shall be established to prevent unauthorized access to portal monitor instrumentation and cabling. A written response plan shall be prepared and implemented to provide evaluation and resolution of all alarm conditions, including requirements for notification in accordance with DOE 5000.3B (and the requirements contained on page I-13, paragraph 5,) in the event of unresolved alarms or malevolent actions. Controls shall be established to ensure detection capabilities during emergency conditions.

c. Waste Monitors.

- (1) For purpose of detecting the theft or diversion of special nuclear material, all liquid, solid, and gaseous waste streams leaving an Materials Access Area shall be monitored for special nuclear material. (Additional monitoring may be required for environmental or waste management purposes. The additional monitoring should be performed in accordance with applicable environmental and waste management

regulations.) Monitoring instrumentation may be semi-quantitative, provided that the monitors used are capable of detecting gamma/neutron radiation characteristics of the specified material type. The facility's waste monitoring equipment shall be maintained and controlled to ensure that the equipment is capable of detecting specified amounts of special nuclear material. Instrumentation used to monitor waste and equipment removed from a Materials Access Area must be able to detect, in combination with other detection elements, the removal of a Category I quantity of special nuclear material through a credible theft or diversion scenario.

- (2) A response plan for evaluating and resolving situations involving any discharge exceeding facility-specific limits approved by the Manager, Operations Office, shall be established and implemented. The plan shall provide for reporting in accordance with DOE 5000.3B and the requirements contained on page I-13, paragraph 5 of this Order, if the situation is not satisfactorily resolved or if there is an indication of malevolent action.
- d. Daily Administrative Checks. A facility-specific daily administrative checks program shall be implemented for each Category I Materials Balance Area (or multiple Materials Balance Areas where rollup to a Category I quantity of special nuclear material is credible). The scope and extent of the checks shall be determined and approved by the Operations Office based upon recognized vulnerabilities. The administrative checks program shall specify the detection objectives, performance procedures, documentation requirements, and response actions.
  - e. Other Detection/Assessment Mechanisms. For each facility, systems capable of detecting and/or assessing special nuclear material removals shall be established consistent with the loss detection elements evaluation requirements on page I-10, paragraph 4. Detection/assessment mechanisms may be based on item identification, number of items, verification of intact tamper-indicating devices, confirmation that no access has occurred, process monitoring, near-real time accountability, control procedures for use and movement of material, or any other approved technique for identifying anomalies. These monitoring and control systems shall provide sufficient information to correctly assess the alarm, localize the removal, and estimate the quantity and form of the diverted or stolen material.