



# U.S. Department of Energy

Oak Ridge Office

ORO O 470  
Chapter IX  
Change 5

**DATE: 05/18/2007**

## **SUBJECT: CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS**

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1. **PURPOSE.** This Chapter correlates to DOE O 470.4, SAFEGUARDS AND SECURITY PROGRAM, dated August 26, 2005, and DOE M 470.4-6, Change 1, NUCLEAR MATERIAL CONTROL AND ACCOUNTABILITY, dated August 14, 2006, by assigning responsibility and accountability and providing administrative and/or contractual guidance to the Oak Ridge Office (ORO) and its contractors. Nothing in this issuance changes any requirements contained in any Department of Energy (DOE) Directive.
2. **CANCELLATION.** This Chapter cancels and replaces ORO O 470, Chapter IX, Change 3, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, dated December 29, 2004.
3. **APPLICABILITY.** The provisions of this Chapter apply to ORO Principal Staff and contractors and subcontractors, to the extent set forth in their contract, on a facility-specific basis, that have responsibility for nuclear materials at facilities owned by or leased to DOE or that have responsibility for DOE-owned nuclear materials at offsite facilities which are exempt from the Nuclear Regulatory Commission licensing and regulation.
4. **RESPONSIBILITIES.** Many ORO contractors have developed Standards/Requirements Identification Documents (S/RIDs) or Work Smart Standards (WSS) Sets that may not include requirements referenced or included in DOE M 470.4-6, Change 1, or this Chapter. Interpretation and performance of Federal responsibilities outlined below must take into account the approved standards set or contract for each particular contractor and must not be deemed to add any requirement to the approved set or contract.
  - a. **Chief, Materials Control and Accountability and Information Security (MC&A/IS) Branch, Office of Security and Emergency Management (OS-203).**
    - (1) Performs those tasks identified in DOE O 470.4, paragraph 5e, as applicable to the requirements of DOE M 470.4-6, Change 1.
    - (2) Examines nuclear material storage reconfiguration plans to determine accessibility of the material for performance of MC&A requirements.
    - (3) Maintains follow-up on all MC&A findings disclosed by ORO Office of Security and Emergency Management (OSEM) surveys and DOE Headquarters (HQ) security evaluations and validates corrective actions prior to closure of findings.

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AND EMERGENCY MANAGEMENT**

- (4) Requires that an annual facility-specific self-assessment plan be submitted by ORO facilities and monitors the adequacy of reports issued on assessments conducted.
  - (5) Notifies ORO program managers and the Manager of anomalous conditions identified in the review of material control indicators and recommends corrective actions.
  - (6) Coordinates the MC&A activities associated with modification of existing or establishment of new operations involving accountable nuclear materials. Advises ORO organizations on the MC&A aspects of inspections by the International Atomic Energy Agency (IAEA).
  - (7) Performs specific international tracking activities as delegated by the DOE HQ Office of International Policy (NA-242).
  - (8) Provides guidance to the Contracting Officer's Representatives (CORs), as necessary, relating to documentation of transactions and other data into the Nuclear Materials Management and Safeguards System (NMMSS).
- b. Director, Procurement and Contracts Division, in consultation with subject matter experts, ensures implementation of the requirements of DOE M 470.4-6, Change 1, in new and existing contracts for ORO facilities.
- c. Contracting Officer's Representatives.
- (1) Perform those tasks identified in DOE O 470.4, paragraph 5p, as applicable to the requirements of DOE M 470.4-6, Change 1.
  - (2) Ensure that facility commitments to discharge MC&A requirements are executed and included in evaluation of contractor performance.
5. REQUIREMENTS AND PROCEDURES. Detailed requirements for implementing an MC&A program are provided in DOE M 470.4-6, Change 1. ORO-specific guidance is provided in Attachments 1 through 3 of this Chapter.
6. REFERENCES.
- a. DOE O 470.4, SAFEGUARDS AND SECURITY PROGRAM, dated August 26, 2005.
  - b. DOE M 470.4-1, Change 1, SAFEGUARDS AND SECURITY PROGRAM PLANNING AND MANAGEMENT, dated March 7, 2006.
  - c. Memorandum, from G. Leah Dever to Pedro S. Garcia, titled "*Delegation of Authority for Responsibilities Assigned to the ORO Manager under DOE Order 474.1A, 'Control and Accountability of Nuclear Materials,'*" dated May 14, 2001, which delegates to the ORO/OSEM MC&A/IS Branch Chief the authority to act in the ORO Manager's behalf relative to responsibilities assigned to the Manager under the Order.
  - d. Memorandum, from Don F. Thress, Jr., to Distribution, titled, "*ORO Implementing Instructions for Incidents of Security Concern,*" dated February 17, 2006.

7. DEFINITIONS. None.
8. CONTRACTOR REQUIREMENTS DOCUMENT. See Contractor Requirements Document, Attachment 1 of this Chapter
9. ATTACHMENTS.
  - a. Attachment 1 – Contractor Requirements Document
  - b. Attachment 2 - Program Administration.
  - c. Attachment 3 - Materials Accountability.
  - d. Attachment 4 - Materials Control.

**CONTRACTOR REQUIREMENTS DOCUMENT**

Contractors that are identified in Paragraph 3 of this Chapter shall accomplish the following, to the extent set forth in their contracts:

- For each facility, develop an materials Control and Accountability program consistent with the requirements of DOE M 470.4-6, Change 1, Sections A and B, and the provisions set forth in Attachments 2, 3, and 4 of this Chapter.

## PROGRAM ADMINISTRATION

**NOTE:** DOE M 470.4-6, Change 1, Section A, Chapter I, contains detailed requirements for Materials Control and Accountability (MC&A) program administration.

1. General. Each facility's initial MC&A Plan and any subsequent MC&A Plan modification that significantly alters the MC&A program shall be forwarded to the Office of Security and Emergency Management (OSEM), Oak Ridge Office (ORO) for review and approval. The OSEM Materials Control and Accountability and Information Security (MC&A/IS) Branch, will coordinate the ORO review and approval process. The MC&A Plan must contain the following signatures of approval: (1) the facility nuclear MC&A Manager; (2) the facility manager or designated alternate; and (3) the ORO/OSEM MC&A/IS Branch Chief.

The facility MC&A Plan shall delineate the process governing review, revision, and change control for the Plan and procedures for its implementation, including interim revisions (i.e., page changes). A minimum review frequency of 2 years for the Plan and implementing procedures is recommended. The MC&A/IS Branch must approve review frequencies longer than 2 years. If the Plan is reviewed and it is determined that no revision is required, the MC&A/IS Branch shall be notified accordingly and the results of the review shall be documented in the MC&A Plan.

The MC&A/IS Branch shall be notified immediately of any change in the facility's MC&A program that would decrease the control and accountability requirements identified in the MC&A Plan.

It is recommended that, to the maximum extent practical, the facility MC&A Plan be organized such that it corresponds to DOE M 470.4-6, Change 1, Section A, Chapters I through III, in order to facilitate its review and use. Components described in Figure 1-1 of this Attachment shall be included in the facility MC&A Plan.

The scope and content of the MC&A Plan for Category III and IV facilities shall be the same as for Category I and II facilities except as specifically authorized by the MC&A/IS Branch.

Safeguards may be terminated on Attractiveness level I special nuclear material (SNM) provided the conditions delineated in DOE M 470.4-6, Change 1, Section A, Chapter I, paragraph 1q(1) are satisfied. Additionally, lower-grade forms of higher Attractiveness Level SNM that meet the criteria delineated in DOE M 470.4-6, Change 1, Section A, Chapter I, Table I-2, may also be considered Attractiveness Level E for purpose of terminating safeguards. If such material must be conditioned to meet the criteria in Table I-2 (e.g., addition of more like material to item in order to reduce the SNM concentration), the proposed conditioning scheme shall be presented to the MC&A/IS Branch for concurrence.

The MC&A/IS Branch shall be notified before the removal of Attractiveness Level D or higher SNM from the facility's inventory. The facility shall not discard the material in question until an assessment is made. For Attractiveness Level D or higher SNM that has been previously removed from the facility's inventory and for which a significant vulnerability exists, the MC&A/IS Branch shall be given written notification within 5 working days from when it is first determined that the previous discard(s) created a significant vulnerability.

2. Graded Safeguards. A graded MC&A program shall be established consistent with the requirements of this Chapter and DOE M 470.4-6, Change 1. In keeping with the graded safeguards concept, ORO facilities may operate under varying safeguards requirements due to different material types, forms, quantities and flows. Requests for deviation from specific requirements of this Chapter and DOE M 470.4-6, Change 1, shall be submitted to the MC&A/IS Branch for review and approval in accordance with DOE M 470.4-1, Change 1, Part 2, Section M. The MC&A/IS Branch will coordinate required Department of Energy reviews and concurrences and, when alternative measures are deemed appropriate, will approve requested deviations.

3. Materials Control and Accountability Requirements for Tritium.

Because tritium has strategic importance, graded safeguards programs for tritium are required in accordance with the requirements of DOE M 470.4-6, Change 1, Section A, Chapter I, subparagraph 3b. The contractor shall prepare special procedures at facilities having tritium and forward them to the MC&A/IS Branch for review.

4. Loss Detection Element Evaluation.

a. Vulnerability Assessment (VA). Prior to development of detailed VAs, which identify and evaluate the capability for detection of a loss of a Category I quantity of SNM and are required for the preparation of the Site Safeguards and Security Plan (SSSP), the contractor shall develop a plan for the assessment and forward it to the MC&A/IS Branch for approval.

b. Performance Testing. The results of performance testing done to satisfy the requirements of DOE M 470.4-6, Change 1, Section A, Chapter I, subparagraph 4c, may be used to satisfy the requirements of DOE M 470.4-6, Change 1, Section A, Chapter I, subparagraph 4b, if such tests can be designed to meet the requirements of both subparagraphs.

c. Materials Control and Accountability Performance Requirements.

(1) The contractor shall notify the MC&A/IS Branch of each performance test failure that indicates a significant vulnerability, SNM at risk, or a systemic MC&A program weakness. Criteria for determining significance and requirement for notification of the MC&A/IS Branch shall be included in the facility performance testing program (PTP) plan. Notification of significant performance test failures shall be made to the MC&A/IS Branch as soon as practical following contractor evaluation of test results, and prior to the issuance of test reports.

(2) An annual plan for the number of performance tests and the topics to be covered shall be prepared by the contractor and submitted to the MC&A/IS Branch by August 15 for the next fiscal year. The contractor shall advise the MC&A/IS Branch of any changes to the PTP plan which materially alter the scope and/or schedule of the plan as such changes occur. Other changes may be reflected in periodic status reports issued to the MC&A/IS Branch. The annual PTP plan shall be approved by the MC&A/IS Branch.

(3) The contractor shall submit periodic status reports to the MC&A/IS Branch. Status reports shall indicate progress of the facility's PTP (actual versus plan) and reflect any changes in the PTP plan scope/schedule since the previous status report. The MC&A/IS Branch will review and concur in the status report frequency and content.

- (4) A copy of each report on a performance test during which a failure occurred shall be provided to the MC&A/IS Branch. Submittal of all other test reports to the MC&A/IS Branch is not required.
  - (5) In order to enhance MC&A program efficiency, contractors are encouraged to conduct performance tests in conjunction with the facility assessment program activities to the maximum extent practical.
5. Incident Inquiries and Reporting. Each facility's MC&A procedures shall contain provisions covering incident inquiries, reporting procedures, and requirements, as described in DOE M 470.4-6, Change 1, Section A, Chapter I, paragraph 5, and modified by ORO *Implementing Instructions for Incidents of Security Concern* for contractors and subcontractors reporting to ORO. (See References 6b and 6d of this Chapter)
  - a. The facility internal notification and reporting system procedures shall include notification to the MC&A/IS Branch of each reportable inventory difference and shipper/receiver difference. If possible, this notification shall be made before the initial incident report (DOE F 471.1, *Security Incident Notification Report*) is filed. In addition, the procedures shall require that a copy of each incident report be forwarded to the MC&A/IS Branch within 2 days after issuance. This requirement pertains to initial incident reports and to monthly incident status reports and final inquiry reports.
  - b. When pertinent data, such as action limits, inventory differences, or shipper/receiver differences are not included with the initial incident report, the contractor shall provide that data by separate transmittal to the MC&A/IS Branch.
  - c. Information documenting that routine monitoring of MC&A loss detection elements was performed shall be retained by the contractor for 1 year, or until the next ORO/OSEM survey of MC&A is conducted at the facility, whichever is longer. Information documenting impact measurement index (IMI) category IMI-1, IMI-2, and IMI-3 incidents shall be permanently retained.
  - d. The MC&A/IS Branch will, as subject matter experts, assist the ORO Classified Matter Protection and Control Operations Manager (CMPCOM)/Inquiry Official in the conduct of inquiries involving MC&A.
6. Administrative Controls.
  - a. The facility program for periodic assessments and reviews shall contain the following procedures:
    - (1) An annual plan for the number of assessments and the topics to be covered shall be prepared by the contractor and submitted to the MC&A/IS Branch by August 15 for the next fiscal year. The contractor shall advise the MC&A/IS Branch of any changes to the annual assessment plan which materially alter the scope and/or schedule of the plan as such changes occur. Other changes may be reflected in periodic status reports issued to the MC&A/IS Branch. The annual assessment plan shall be approved by the MC&A/IS Branch.

- (2) The contractor shall submit periodic status reports to the MC&A/IS Branch. Status reports shall indicate progress of the facility's assessment program (actual versus plan) and reflect any changes in the annual assessment plan scope/schedule since the previous status report. The MC&A/IS Branch will review and concur in the status report frequency and content.
    - (3) A copy of each report on an assessment or review during which a discrepancy was cited that remains uncorrected at the time the report is issued shall be provided to the MC&A/IS Branch. Submittal of all other reports on assessments and reviews to the MC&A/IS Branch is not required.
    - (4) An independent audit of the facility's MC&A function shall be conducted in accordance with the requirements of DOE M 470.4-6, Change 1, Section A, Chapter I, subparagraph 6c. The audit frequency shall be approved by the MC&A/IS Branch and documented in the facility's MC&A Plan.
  - b. The contractor shall update by April 1 of each year its historical accountability report for activity through the end of the previous fiscal year and forward it to the MC&A/IS Branch. The report shall contain yearly data on throughput, inventory differences, operating losses, and other book adjustments, along with narrative explaining the data.
7. DOE Material at Nuclear Regulatory Commission (NRC) Licensee Sites. The contractor shall assist ORO in verifying the presence of DOE-owned material (leased or loaned) at NRC licensee sites.

**FIGURE 1-1  
ADDITIONAL MC&A PLAN COMPONENTS**

The following components, as applicable, shall be included in the facility Materials Control and Accountability (MC&A) Plan:

1. A copy of each Department of Energy (DOE) letter or memorandum, specific to the facility's activities, that clarifies requirements or grants a deviation from the requirements of this Chapter or DOE M 470.4-6, Change 1 (inclusion of sensitive or classified documents in the Plan may be made by reference).
- \*2. Vulnerability assessments on which the MC&A program is based.
- \*3. Procedure Manuals used in the material balance areas for performance of MC&A requirements, emergency plans, and security directives that promote understanding of the overall MC&A program.
- \*4. Description of safeguards measures implemented for Attractiveness Level D or higher Special Nuclear Material (SNM) that has been removed from inventory as waste and for which a significant vulnerability exists.
- \*5. Security procedures being used as alternates for MC&A procedures required by DOE M 470.4-6, Change 1, Section A, Chapter III.
- \*6. Documentation that contains MC&A/IS Branch approval of facility-specific limits beyond which a response plan for evaluating and resolving waste discharges is required (see DOE M 470.4-6, Change 1, Section A, Chapter III, subparagraph 5d(2)).

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\* Inclusion in the MC&A Plan by reference is required; however, actual inclusion of document in the MC&A Plan is at the contractor's option.

## MATERIALS ACCOUNTABILITY

**NOTE:** DOE M 470.4-6, Change 1, Section A, Chapter II, contains detailed requirements for MC&A program materials accountability. Specific instructions for implementing Nuclear Materials Management and Safeguards System (NMMSS) reporting and data submission requirements are contained in DOE M 470.4-6, Change 1, Section B, Chapters I through XVII.

1. General. The provisions of DOE M 470.4-6, Change 1, Section A, Chapter II, generally apply to all categories of material balance areas (MBAs). Limitations to general applicability are specifically expressed. Facility-specific deviations may also limit applicability. All such deviations shall be formally approved and incorporated into the facility MC&A Plan and Site Safeguards and Security Plan (SSSP).
2. Accounting Systems. Nuclear material accounting systems must provide for the following:
  - a. Accurate nuclear materials information relating to receipts, transfers, inventories, and shipments sufficient to establish a complete audit trail from receipt through disposition; and
  - b. Accountability data in a timely manner as required for submission to the Nuclear Materials Management and Safeguards System (NMMSS).
3. Inventories.
  - a. Physical Inventories.
    - (1) Physical Inventories. Inventory values shall be based on measured values, including measurements or technically justifiable estimate of holdup, unless an alternative inventory method is approved. Proposed alternative inventory methods shall be submitted to the MC&A/IS Branch for review and approval in accordance with DOE M 470.4-1, Change 1, Part 2, Section M. For material which is inaccessible for measurement by sampling during processing or recovery operations, the process monitoring parameters, material control procedures, measurements or specific action criteria for tracking materials in process, will be approved by the MC&A/IS Branch.
    - (2) Conduct of Inventories. Statistical sampling plans prepared by the contractor for verification of the presence of items, that are not documented in the facility MC&A Plan, shall be forwarded to the MC&A/IS Branch for approval.
    - (3) Physical Inventory Frequencies. Inventory frequencies are facility specific and will be approved by the MC&A/IS Branch Chief. Any proposed reduction of the minimum physical inventory frequency requirements stated in DOE M 470.4-6, Change 1, shall require approval in accordance with DOE M 470.4-1, Change 1, Part 2, Section M.
  - b. Special Inventories. External requests for special inventories shall be forwarded to the MC&A/IS Branch for approval. This requirement does not apply to activities conducted during Oak Ridge Office (ORO)/Office of Security and Emergency Management (OSEM)

surveys or DOE Office of Independent Oversight and Performance Assurance (OA) reviews, which are part of system performance tests.

c. Inventory Verification/Confirmation Measurements.

- (1) Confirmatory measurements may be made in lieu of verification measurements on items that are tamper-indicating provided such items are under appropriately graded materials surveillance programs in accordance with DOE M 470.4-6, Change 1, Section A, Chapter III, paragraph 3, and the requirements of Attachment 3, paragraph 3, of this Chapter.
- (2) Statistical sampling plans and quantity thresholds for inventory verification/confirmation measurements will be approved by the MC&A/IS Branch.
- (3) The control limits for inventory confirmation/verification measurements for Category I and II items will be reviewed and approved by the MC&A/IS Branch.

4. Measurements and Measurement Control. The contractor shall strive to optimize the accuracy and precision of its measurement of nuclear materials. Use of external measurements and measurement control expertise in pursuit of improvement is encouraged. The scope and content of the measurements and measurement control programs for Category I and II facilities are defined in DOE M 470.4-6, Change 1, Section A, Chapter II, subparagraphs 4a through 4e. The scope and content for Category III and IV facilities will be approved by the MC&A/IS Branch.

5. Material Transfers.

a. External Transfers.

- (1) Prior to transfer, written verification shall be obtained that the intended receiver is authorized to accept the material, and shall be retained until all transfers are complete. Required verification may be in the form of the intended receiver's written acknowledgement/acceptance of shipper's request to transfer the material.
- (2) When "safeguards closure" is applied to a transaction, in accordance with DOE M 470.4-6, Change 1, Section A, Chapter II, subparagraph 5a(4)(f), records of transfer checks shall be retained until the next ORO/OSEM survey of MC&A is conducted at the facility following final closure of the transaction.
- (3) Measurement Requirements for External Transfers of Nuclear Materials.
  - (a) The requirement for measured values for Category III and IV quantities will be made by the MC&A/IS Branch and be included in the facility MC&A Plan upon its reissuance. Requests to permit material to be put into process prior to completion of the required accountability measurement shall be submitted by the contractor to the MC&A/IS Branch. Designation of materials on which receiver verification cannot be performed without destroying the item, such as weapons assemblies or subassemblies, and certain reactor fuel elements, shall be approved by the MC&A/IS Branch and included in the facility MC&A Plan.

- (b) When the receiver's accountability measurement performed subsequent to a safeguards closure indicates a significant shipper/receiver difference as described in DOE M 470.4-6, Change 1, Section A, Chapter II, subparagraph 6a(1)(b), the MC&A/IS Branch shall be notified with necessary documentation to permit initiation of a resolution process with the shipping partner's responsible DOE Field Element organization.
    - (c) Shipper-receiver agreements shall be prepared by the responsible facility and MC&A managers and by contractor and program managers. The agreements shall be forwarded to the MC&A/IS Branch for coordination and approval.
    - (d) When limited processing of "difficult-to-measure" material is necessary to perform a receipt measurement and no shipper/receiver agreement covering the material exists, the MC&A/IS Branch shall be notified. The MC&A/IS Branch will obtain the approval of the shipper's operations office and concurrence of DOE Office of Security Policy (HS-70).
  - b. Internal Transfers. The MC&A/IS Branch shall be notified if any abnormal situation is detected in evaluating internal transfers.
- 6. Material Control Indicators.
  - a. Shipper/Receiver Difference Assessment.
    - (1) The contractor, unless specifically excluded in writing by the MC&A/IS Branch, shall provide a copy of an annual summary report on analyses of shipper/receiver trend data to the MC&A/IS Branch. This requirement applies to standard, measured flows suitable to trend analysis. The annual report shall be submitted within 60 calendar days after the end of the calendar year.
    - (2) The MC&A/IS Branch shall be notified if there is a question about the validity of the shipping partner's limit of error calculations.
    - (3) The MC&A/IS Branch shall be notified of any shipper/receiver differences resulting from a discrepancy in the number of items.
    - (4) To resolve statistically significant shipper/receiver differences, the MC&A/IS Branch will coordinate with the corresponding government organization (DOE Field Element, NRC, etc.) regarding the validity of the measurements and limits of error.
    - (5) When there is a significant unresolved shipper/receiver difference, the material shall not be processed unless approved by the MC&A/IS Branch.
  - b. Inventory Difference Evaluation.
    - (1) The contractor shall provide the MC&A/IS Branch a summary report on evaluations of facility inventory difference data. Reports shall include SNM (including tritium) and cascade uranium. The summary report shall include the following:
      - (a) Certified Material Balance Report, NMMSS Report M-742, for the current reporting period and fiscal year-to-date information.

For each facility, the contractor shall review Material Balance Reports generated by the NMMSS. The facility representative shall note changes required, certify the reports are correct as noted, and submit data reflecting any changes to the NMMSS, with a copy of the certified report forwarded to the MC&A/IS Branch.

Reporting frequencies for ORO facilities are as follows:

<u>Facility</u>	<u>RIS Code*</u>	<u>Frequency</u>
ACEMP	FBJ	Annually
BWX Technologies	FCW	Annually
ETTP (Bechtel Jacobs)	FZE	Annually
LBNL**	LZA	Annually
MCLinc	FCC	Annually
ORISE	FBF	Annually
ORNL (UT-Battelle)	FZG	Annually
ORNL (Bechtel Jacobs)	FZK	Annually
ORNL (Isotek/Bldg. 3019)	FBI	Semiannually***
Paducah (UDS)	GBB	Annually
Paducah (PRS)	FYC	Annually
Portsmouth (UDS)	GBC	Annually
Portsmouth (LATA/Parallax)	GBA	Annually
SLAC**	LXA	Annually
TJNAF**	FBH	Annually
Y-12 (Bechtel Jacobs)	FZJ	Annually

\*Primary Reporting Identification Symbol (RIS) Code for facility to which the indicated reporting frequency applies.

\*\*Under the current Office of Science (SC) organization, Heads of Laboratories report directly to the Chief Operating Officer. As part of the SC Integrated Support Center, ORO provides security services to LBNL, SLAC, and TJSO, including MC&A.

\*\*\*Bimonthly once processing begins.

- (b) For inventory differences in Category I and II MBAs, the following data presentations shall be included, unless specifically excluded in writing by the MC&A/IS Branch: (1) tables showing element and isotope differences for each regular inventory for the past 24 inventory periods, and (2) chart showing isotope differences for each regular inventory for the past 24 inventory periods. The chart shall also depict warning and alarm limits.

**NOTE: The report shall be submitted to the MC&A/IS Branch within 45 calendar days after closure of the reporting period. For those reporting periods in which NMMSS is late in closing out, the 45 days shall be extended by the number of days that NMMSS is late in closing.**

- (2) Statistically valid techniques to derive inventory difference control limits, other than variance propagation, may only be used if justified on the basis of factors such as limited data, low transfer rates, material categories, or other process variations and approved by the MC&A/IS Branch.

c. Evaluation of Other Inventory Adjustments (and Explanations).

- (1) The contractor shall provide a Facility Control Data Sheet reporting summary explanations on inventory data adjustments to the MC&A/IS Branch. These data sheets are required on SNM (including tritium) and cascade uranium for reporting periods in which there is activity in lines 74 (Normal Operating Losses), 75 (Accidental Losses), 76 (Approved Write-Offs), or 77 (Inventory Differences) of the Material Balance Report. Definitions of the inventory difference categories are provided in Figure 2-1, and an example of the Facility Control Data Sheet is included as Figure 2-2 of this Attachment.

High-enriched and low-enriched uranium data shall be reported separately. Also, explanations for non-routine losses or discards, including Attractiveness Level D or higher SNM that has been removed from inventory as waste, shall be provided as an attachment to the control data sheet. These facility control data sheets, when required, shall be included with the inventory difference evaluation reports when they are submitted for the facility reporting period.

- (2) The contractors shall report radioactive decay on the Material Balance Report to the NMMSS on a quarterly basis for reportable quantities. Although the requirement to report Berkelium to NMMSS has been discontinued, it must continue to be accounted for at the site/facility level (refer to Figure 2-3 for half-life and decay factors for Berkelium).

**NOTE: As required, the MC&A/IS Branch will coordinate periodic meetings with facility contractors to discuss actions resulting from evaluations of material control indicators.**

7. Documentation and Reporting.

a. Nuclear Material Transaction Report.

Contractors shall have internal controls in place at the facilities to ensure the data submitted to the NMMSS agree with the data reported on the source documents.

Implementing instructions specific to certain problem areas follow:

(1) Shipments/Receipts.

- (a) Transactions Involving International Accounts. To the extent receiver's data is provided by a foreign recipient, it shall be entered into the NMMSS by the domestic shipper.
- (b) Closure of Foreign Transfers.

- 1 For shipments of nuclear material being donated to foreign countries, the shipping facility shall close the receiver's side of the transaction by submitting the receiver's data to NMMSS at the same time the shipper's data is submitted to NMMSS.
- 2 For shipments of nuclear material to foreign countries for which payment has been received in advance and for which no inquiries or receipted documents (DOE/NRC Form 741) have been received within 90 calendar days following shipment, the shipper shall close the receiver's side of the transaction.
- 3 For shipments of nuclear material to foreign countries for which payment is to be made after delivery, and for which a receipted document (DOE/NRC Form 741) has not been received, but according to financial records payment has been made, the shipper shall close the receiver's side of the transaction upon notification of payment.
- 4 When notification that shipment has been received (i.e., TWX, facsimile, telephone, letter, with or without additional shipper's request) from an appropriate official within the foreign entity to which the material was shipped, the shipper may effect closure.

**NOTE: In all of the above, the shipper should take whatever steps are necessary to ensure that the notification that is being relied on for closure relates to the shipment transaction being closed.**

- (c) Transactions Involving Licensees. In those instances in which the other party to a transaction is a licensee and is not required to report shipper or receiver data (e.g., a transaction involving source material), facility personnel shall nevertheless prepare the required data for entry into the NMMSS. The transaction is a one-party type and shall show an "M" action code.
- (d) Transactions Involving Waste Disposition Areas and/or Waste Management Areas.

DOE/NRC Forms 741 shall be used to document transfers of nuclear material from one waste disposition area ("four character" RIS) to another. DOE/NRC Forms 741 shall also be used to document transfers of nuclear material from one waste management area ("V" RIS) to another. For such transfers of nuclear material between RISs administered by ORO, the MC&A/IS Branch will consider the preparation of summary DOE/NRC Forms 741 (documenting all transfers during a period). If summary DOE/NRC Forms 741 are approved, internal site records must be sufficient to reconcile all nuclear material inventory data during the period.

In general, the above guidance applies to nuclear material currently recorded under a RIS. It does not usually apply to transfers of matter contaminated with unrecovered nuclear material that has been previously written off the books as an inventory difference, normal/accidental loss, or approved write-off (e.g., construction/D&D debris, soil, sludge, etc.); however, DOE/NRC Form 741 documentation shall be provided if required to meet the receiver's licensing/regulatory requirements.

- (e) Material-in-transit (Domestic Shipments). The following supplemental guidance is intended to clarify the material-in-transit rule:

1 Basic Concepts.

- a *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. A *transfer check* is required immediately after *receipt*.
- b Material is considered to be *in transit* until *receipt* occurs; however material *in transit* at the end of a reporting period shall be included in the receiver's reported inventory. Material *in transit* does not result in a reportable inventory difference.
- c The date of *receipt* will be used to "start the clock" to determine the allowable time frames for NMMSS reporting, material confirmation, and/or accountability measurements.

2 Related NMMSS Transactions.

An *A-J* transaction must be submitted by the receiver for the following three scenarios:

- a Material is *in transit* at the end of the reporting period. The *action date* on the DOE/NRC Form 741 shall be the last day of the preceding calendar month. (Note: As stated above, such an *A-J* transaction does not "start the clock".)
- b *Receipt* of material has occurred during the current process month and the material shall be measured by the receiver at a later date and closed by an *A-E* transaction. The *action date* for the *A-J* shall be the date of *receipt*. If the closing *A-E* transaction shall be delayed more than 10 calendar days following *receipt*, an *A-N* or *A-U* transaction must also be submitted. (Note: An *A-N* or *A-U* transaction must always be preceded by an *A-J*; however, if an *A-J* transaction had already been submitted for this material transfer under Scenario a above, only the *A-N* or *A-U* transaction is required at the time of *receipt*.)
- c Although this scenario is highly unlikely, an *A-J* transaction would also be required if [1] *receipt* of material has occurred, [2] the receiver plans to accept the shippers weights without measurement with an *A-B* transaction (upon the completion of a successful *transfer check*), but [3] the *A-B* transaction cannot be submitted within 10 calendar days of receipt. As in the preceding scenario, the *action date* for the *A-J* transaction would be the date of *receipt*, and an *A-N* or *A-U* transaction would also be required. While an *A-N* or *A-U* transaction must always be preceded by an *A-J*; an *A-J* transaction need not be followed by an *A-N* or *A-U* except as discussed in Scenarios b and c above.

- (2) Shipments Awaiting Processing. The following guidance is given concerning materials being received that are awaiting processing:
- (a) On shipments that will be measured within 30 calendar days, record as an "N" action code.
  - (b) On shipments that will be measured beyond 30 calendar days, record as a "U" action code.
  - (c) After determination of measured values, the transaction shall be closed using an "E" action code ("B" action code if accepting shipper's values).

If it appears that a shipment will not be processed within a 2-year time period, notify the MC&A/IS Branch so a determination can be made as to how to handle the transaction.

- (3) Distribution of Copies. All NMMSS submissions shall be sent to the following address \*/\*\*:

NAC International  
NMMSS Project  
P.O. Box 922088  
Norcross, Georgia 30010

\* Unclassified submissions should be sent "Attention: Program Administration."

\*\* Classified submissions should be sent "Attention: Document Control."

**FIGURE 2-1**  
**DEFINITIONS OF INVENTORY DIFFERENCE CATEGORIES**

1. Lower Warning Limit (*was NMMSS code 84*): The lowest level of inventory difference, which when exceeded requires investigation and appropriate action.
2. Upper Warning Limit (*was NMMSS code 85*): The highest level of inventory difference, which when exceeded requires investigation and appropriate action.
3. Lower Alarm Limit (*was NMMSS code 86*): The lowest level of inventory difference, which when exceeded requires immediate action.
4. Upper Alarm Limit (*was NMMSS code 87*): The highest level of inventory difference, which when exceeded requires immediate action).
5. Redetermination of Discrete Items on Inventory (*was NMMSS code 88*): Increases or decreases in nuclear material quantities identified by remeasurement or recheck of item counts of material previously reported and entered into the appropriate records. Consult DOE M 474.1-1B and DOE N 471.3 for guidance regarding when a change in item count may result in an incident of security concern.
6. Redetermination of Material in Process (*was NMMSS code 89*): Increases or decreases in nuclear material quantities identified by remeasurement or recheck of item counts of material previously reported and entered into the appropriate records. Increases or decreases typically are the result of one or more of the following:
  - (a) Substitution of direct measurement of the content of spent fuel as determined in the accountability tank for values based on fuel fabrication data and reactor calculations.
  - (b) Implementation of improved nondestructive assay (NDA) for measuring items of static inventory for material such as scrap.
  - (c) Replacement of values obtained by NDA techniques with values obtained from chemical measurements.
7. Process Holdup Differences (*was NMMSS code 90*): Differences between present and previous reporting periods for material that is physically inside equipment but is part of the material flow and is subject to cleanout. This category is not to be used for equipment holdup differences (see #8 below).
8. Equipment Holdup Differences (*was NMMSS code 91*): Differences between present and previous reporting periods for material which adheres so tenaciously to the internal workings of the equipment that it has become, in effect, part of the equipment or requires special treatment to remove. This category is not to be used for process holdup differences (see #7 above).

**FIGURE 2-1 (Continued)**  
**DEFINITIONS OF INVENTORY DIFFERENCE CATEGORIES**

9. Measurement Adjustments (*was NMMSS code 92*): Problems associated with measurement control and calibration. Applies when:
  - (a) The measurement control program has detected a bias not previously identified or a revised bias for which no allowance was made during physical inventory and
  - (b) Measurements are made on the basis of factors or averages that are subject to updating by the measurement control program.
10. Rounding (*was NMMSS code 93*): Accumulated fractional quantities of SNM dropped from or added to the values reported to DOE/NNSA in accordance with the required NMMSS reporting units.
11. Recording and Reporting Errors (*was NMMSS code 94*): Errors detected in record keeping and reporting functions.
12. Shipper-Receiver Adjustments (*was NMMSS code 95*): The receiver's adjustment to quantities of SNM originally entered at shipper's values. Included in this category are adjustments resulting from:
  - (a) Identification of material formerly reported as a NOL and subsequently found, and
  - (b) Measurement differences derived from items received from sites which do not have measurement capability (e.g., items shipped from the Pantex Site or from other facilities to a recovery site where a difference between the shipping site's book value and the recipient's measurement value is found).
13. Identifiable Item Adjustments (*was NMMSS code 96*): Identifiable items not found during inventory or identifiable items returned to inventory control. **Consult DOE M 470.4-1 for guidance regarding when a change in item count or an adjustment may result in an incident of security concern.**
14. Actual Inventory Difference (*was NMMSS code 97*): The algebraic difference between the actual and the explained (categories #5 thru #13 above) inventory difference.
15. Material Unaccounted For (*was NMMSS code 99*): Any portion of the actual inventory difference that falls outside established control limits. **Consult DOE M 470.4-1 for guidance regarding when a change in item count or an adjustment may result in an incident of security concern.**

**FIGURE 2-2  
OAK RIDGE OFFICE  
FACILITY CONTROL DATA SHEET**

Reporting Facility \_\_\_\_\_  
RIS \_\_\_\_\_ Material Type \_\_\_\_\_ Period \_\_\_\_\_

\*\*\*\*\*

A. Inventory Difference Summary

Information Categories	Element Weight	Isotope Weight
77. INVENTORY DIFFERENCE (Book-Physical ID, BPID)	_____	_____
• Redetermination of Discrete Items on Inv.	_____	_____
• Redetermination of Material in Process	_____	_____
• Process Holdup Differences	_____	_____
• Equipment Holdup Differences	_____	_____
• Measurement Adjustments	_____	_____
• Rounding	_____	_____
• Recording and Reporting Errors	_____	_____
• Shipper-Receiver Adjustments	_____	_____
• Identifiable Item Adjustments	_____	_____
<hr/>		
Total Explained ID	_____	_____
ACTUAL INVENTORY DIFFERENCE	_____	_____
<u>Control Limits:</u> Alarm - Upper Limit	_____	_____
Lower Limit	_____	_____
Warning - Upper Limit	_____	_____
Lower Limit	_____	_____

\*\*\*\*\*

B. Losses/Writeoffs

74. Normal Operating Losses/Measured Discards	_____	_____
75. Accidental Losses	_____	_____
76. Approved Writeoffs	_____	_____

\*\*\*\*\*

	<u>Element Wt., Kg.</u>	<u>Isotope Wt. Kg.</u>
C. 80. Ending Inventory	_____	_____

**FIGURE 2-3  
HALF-LIFE AND DECAY FACTORS FOR BERKELIUM**

**Table 2-2A. Half Life and Daily Decay Factor\***

Element	Isotope	Half-Life	Standard Deviation	Daily Decay Constant (days <sup>-1</sup> )
Berkelium	249	330 d	4.000 d	0.00210045

\* Source: DOE M 470.4-6, Table XV-4.

**Table 2-2B. Decay Factors for Monthly Reporting Periods\***

Element	Isotope	Deduct From	Decay Factors for Months (Days in Month)			
			28	29	30	31
Berkelium	249	Isotope**	0.058812	0.060913	0.063013	0.065114

\* Source: DOE M 470.4-6, Table XV-5

\*\* Deduct calculated Decay Weight from Isotope Weight

**Table 2-2C. Decay Factors for Quarterly Reporting Periods\***

Element	Isotope	Deduct From	Decay Factors for Quarter (Days in Quarter)			
			89	90	91	92
Berkelium	249	Isotope**	0.186940	0.189040	0.191141	0.193241

\* Source: DOE M 470.4-6, Table XV-6

\*\* Deduct calculated Decay Weight from Isotope Weight

## MATERIALS CONTROL

**NOTE:** DOE M 470.4-6, Change 1, Section A, Chapter III, contains detailed requirements for Materials Control and Accountability (MC&A) program materials control.

1. General. Materials control procedures required by DOE M 470.4-6, Change 1, Section A, Chapter III, may be covered by existing security procedures at the option of the contractor. Contractor shall document security procedures being used as alternates for required MC&A procedures and submit to Materials Control and Accountability and Information Security (MC&A/IS) Branch for concurrence.
2. Access Controls.
  - a. Materials Access. The documented access control program shall be referenced in the MC&A Plan.
  - b. Data Access. Facility documentation shall identify the data and information to which this requirement applies.
  - c. Equipment Access. Facility documentation shall identify the equipment to which this requirement pertains and shall identify the nature of the access control that pertains to each category of equipment.
3. Material Surveillance. The documented material surveillance program shall be referenced in the MC&A Plan. The material surveillance program for Category IV quantities must be site/facility specific and approved by the MC&A/IS Branch Chief.
4. Material Containment. The documented material containment program shall be referenced in the MC&A Plan.
5. Detection/Assessment. Documentation substantiating that daily administrative checks were made shall be retained for 1 year or until the next Oak Ridge Office/Office of Security and Emergency Management survey of MC&A is conducted at the facility, whichever is longer.

Documentation of the scope and extent of the facility daily administrative checks shall be prepared and forwarded to the Cognizant Contracting Officer's Representatives and MC&A/IS Branch for approval. Documentation may be in the form of a letter or may be included in the facility MC&A Plan provided that the MC&A Plan document is kept current.