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NUCLEAR SURVEILLANCE & AUDITING CORPORATION

7777 LEESBURG PIKE . FALLS CHURCH, VA. 22043

DRAFT STANDARD FORMAT AND CONTENT
FOR THE SPECIAL NUCLEAR MATERIALS CONTROL
AND ACCOUNTING SECTION OF THE
LICENSE APPLICATION FOR
THE FUEL REPROCESSING AND
CERTAIN SPECIAL NUCLEAR MATERIALS
FACILITIES

Prepared for
The Regulatory Staff
U.S. Atomic Energy Commission

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MASTER

Falls Church, Virginia

December 13, 1973

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NuSAC Report No. 139

NuSAC

(703) 893-6004

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FOREWORD

The Atomic Energy Act of 1954, as amended, directs the Atomic Energy Commission (AEC) to regulate the receipt, possession, use, transfer, ownership, export, and import of Special Nuclear Materials (SNM).

The Act vests the AEC with the authority and the responsibility for regulating the above functions for purposes of protecting health and minimizing danger to life or property and promoting the common defense and security.

In compliance with its assigned charter, the AEC has formulated regulations with which organizations and individuals possessing SNM must comply. These requirements have been well-publicized in the Federal Register, letters of instruction, procedures, guides, and public presentations. The principal requirements are found in Title 10, Code of Federal Regulations, Part 70 (10CFR70), "Special Nuclear Materials"; other pertinent regulations include 10CFR50 and 10CFR73.

Paragraph 70.3 of 10CFR70 requires that anyone possessing or using SNM be licensed by the AEC, except those exempted by Paragraphs 70.11 - 70.14. Paragraphs 70.18 - 70.20 describe the types of licenses to be granted by the AEC. Paragraph 70.22 describes the content of the license application. For production or utilization facilities, paragraph 50.34 of 10CFR50 applies.

In presentations before technical societies and other public forums, the AEC has committed itself to expediting the AEC review of license applications. AEC experience indicates that very time-consuming correspondence invariably

has developed following initial application for a license because of insufficient information for a complete review. Compounding the problem is the forecast of a substantial increase in the number and content of applications to be prepared, filed, and reviewed.

Most problems confronting a license applicant fall into one of two areas.

First, what subject should be covered so as to adequately define the application, and second, what detailed information is pertinent to a prompt review and judgment of the adequacy of the submission by the regulatory staff of the AEC.

The objective of a standard format is to expedite the processing of an application and to reduce delays resulting from incomplete applications and supplemental correspondence. This Standard Format provides a definition of the significant features by which an adequate first submission might be prepared. Further, use of a standard format contributes to the establishment of a common basis for license applications which is of material assistance to an orderly review and judgment by AEC Regulatory Staff.

The license applicant is urged to prepare his application in accordance with this Format, providing descriptive information in each section to support his conclusion that he will be able to operate in accordance with the pertinent regulations.

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INTRODUCTION

Purpose and Applicability

The Standard Format and Content for the Special Nuclear Material Control and Accounting Section of the license application has been prepared by the AEC regulatory staff to encourage uniformity and completeness in submissions by applicants for a license to acquire, possess or use special nuclear materials (SNM) in quantities exceeding one effective kilogram in unsealed form, other than a license to operate a reactor pursuant to 10CFR50. Its objectives are to indicate the information needed to evaluate the application and judge its adequacy, and to provide a specific location in the application for each specific category of information. The information must be sufficient to permit review and judgment as to the adequacy of SNM control and accounting to preclude undue risk to the health and safety of the public and to promote the common defense and security of the nation.

Principal requirements for the license application are currently specified in 10CFR70, with other pertinent requirements reflected in 10CFR50 and 10CFR73. The Standard Format identifies the principal detailed information that is required for the orderly review and evaluation of the license application. In some special circumstances, sections of the Format may not be applicable, or an applicant may see a need to include data beyond that specified and such information should be provided as discussed under Supplementary Information, below.

Use of Standard Format

The Standard Format requires the submission to be divided into 13 Chapters

(e.g., Chapter 2.0, Facility Description); within each chapter the material is arranged in sections (e.g., 2.1, Description of Business), and subsections (2.1.1 - Facility Layout) as the details may require. Careful attention to this Format will materially assist in the prompt review of the application.

Definitions

Terms used in this Format have the meanings defined in 10CFR50, 10CFR70, and 10CFR73. In addition, the following terms are defined:

- (a) Plant - a set of processes of operations coordinated into a single manufacturing, R & D, or testing effort. A scrap recovery operation servicing more than one plant, or offsite customer, should be treated as a separate plant.
- (b) Scrap - materials which cannot be used in the processes or operations of the plant without processing to a different, useful form, and for which such recovery processing, either in-house or by an outside contractor, is deemed economically feasible.
- (c) Waste - materials which cannot be used in the processes or operations of the plant and for which recovery processing is deemed uneconomical.

License Content

It is not intended that all of the information requested in this Standard Format become a part of the license conditions or technical specifications; much of it is information in support of the application and is necessary to a prompt review and evaluation by the regulatory staff.

The Material Control and Accounting section of the license application should be submitted in two parts. Part A should contain the material control and accounting program of the applicant, including the measurement control program. Part B should contain the substance of Part A plus all necessary detail to support the ability of the applicant to implement his material control and accounting program as described in Part A. Part A will be incorporated in the license as license conditions or technical specifications. Consequently, it cannot be changed except by amendment to the license.

Each of the Chapters in the Standard Format should be addressed in Part A. Considerable care should be taken in the preparation of Part A to assure it meets the requirements of the regulations and that the commitments made by the applicant can be met routinely in the operation of the facility.

Exceptions and Exemptions

The applicant may determine that it is necessary to request an exception to, or exemption from, a specific provision of the Regulations. He should state in a letter, separate from his application, the specific exemption requested or the specific nature of the exceptions requested (i.e., the alternative provision to be incorporated in his license). Further, he should provide in the letter the detailed reasons for requesting an exemption or an exception and justify the acceptability of the alternative provision. A description of the steps being taken to eventually permit compliance with the regulations must also be incorporated in the submittal. The request for exemption or exception should be in a form suitable for publication and filing in the Public Document Room.

Public Disclosure

The AEC has determined that public disclosure of the details of material control and accounting programs is not in the public interest, pursuant to Paragraph 2.790(d) of 10CFR2. Thus, the programs should be submitted as separate enclosures from the transmittal letter and any request for an exemption or exception from an applicable requirement. Proprietary and classified information should be clearly identified and submitted in enclosures. Each submission of proprietary information should be accompanied with the applicant's detailed reasons and justifications for requesting exemption from public disclosure, as required in Paragraph 2.790(b) of 10CFR2.

Design Information

It is recognized that, upon initial application for a construction permit or construction authorization, the license applicant will not have complete detail regarding his material control and accounting program and measurement control program. However, the applicant should follow the Standard Format in submitting his design criteria and design bases for a material control and accounting program which will meet the intent of the Federal Regulations.

In this connection, it is expected that the applicant can respond fairly completely to the information requested in Chapters 2, 3, 7 and 11 of the Standard Format, and to a lesser degree to Chapters 1, 8, 9 and 10. The information supplied in Chapter 12 should reflect the design criteria established for the facility and processes of the applicant. The applicant's response in Chapters 4, 5, and 6 should detail the design bases which will permit the

material control and accounting, reflected in Chapter 12, to be accomplished. Sufficient detail should be provided to establish that adequate attention has been given to material control and accounting in the design of the facilities and processes for which a license is being requested by the applicant.

Regulatory Guides

Certain AEC Division 5 Regulatory Guides, "Materials and Plant Protection", have been issued, and others are to be issued, to provide guidance for applicants and licensees with respect to measures which comply with the Federal Regulations (see especially 5.3, 5.4, 5.5, 5.6, 5.8, 5.9, 5.10, 5.11, 5.13). It is recommended that the applicant review these Guides, since they may be of assistance in responding to the information requested in this Format.

Style and Composition

A table of contents should be included in each submittal. The applicant should strive for clear, concise presentations of the information provided. Confusing or ambiguous statements and general statements of intent must be avoided. Definitions and abbreviations should be consistent throughout the submittal and consistent with generally accepted usage.

The applicant should direct his responses to the subject matter of each section as it specifically applies to the control and accounting of SNM. Whenever possible, duplication of information should be avoided. Thus, information already included in other sections of the application may be covered by specific reference to those sections.

Where numerical values are stated, the number of significant figures should reflect the accuracy or precision to which the number is known. The use of relative values should be clearly indicated.

Drawings, diagrams, and tables should be employed where the information may be presented more adequately or conveniently by such means. These should be located with the section where primarily referenced. Due concern should be taken to assure that all information presented in drawings is legible, symbols are defined, and drawings are not reduced to the extent that they cannot be read by unaided normal eyes.

Physical Specifications of Submittals

All material submitted as part of the license application for Special Nuclear Materials Control and Accounting Section should conform to specific standards as to the physical dimensions of page size, quality of paper and inks, and numbering of pages; more specifically:

1. Paper size

Textual pages: 8-1/2 x 11 inches.

Drawings and graphics: 8-1/2 x 11 inches preferred; however, a larger size is acceptable provided the finished copy when folded does not exceed 8-1/2 x 11 inches.

2. Paper stock and ink

Suitable quality in substance, paper color, and ink density for handling, and reproduction by microfilming.

3. Page margins

A margin of no less than one inch is to be maintained on the top, bottom and binding side of all pages submitted.

4. Printing

Composition: textual pages should be single spaced.

Type face and style: must be suitable for microfilming.

Reproduction: may be mechanically or photographically reproduced.

All pages of the text may be printed on both sides and image printed head-to-head.

5. Binding

Pages should be punched for loose-leaf ring binding.

6. Page numbering

Pages should be numbered by section and sequentially within the section. Do not number the entire report sequentially. Numbering should follow this Format insofar as possible. All references to this Format shall also be by section.

Procedures for Updating or Revising Pages

The updating or revising of data and text should be on a replacement page basis.

The changed or revised portion of each page should be highlighted by an asterisk mark. This mark should be on the margin opposite the binding margin for each line changed or added. All pages submitted to update, revise or add pages to the report are to show the date of change. The transmittal letter should include an index page listing the pages to be inserted and pages to

be removed. Where major changes or additions are made, pages for a revised Table of Contents should be provided.

Number of Copies

The licensee should submit ten (10) copies of each required submittal pursuant to Paragraph 70.21 of 10CFR70.

Supplementary Information

The design of a standard format attempts to achieve efficiency by standardization of content and enhancing information retrieval. There is a specific place to put information and thus it is possible to find it promptly as needed. However, the applicant may feel that the requirements of this Format do not cover all important aspects of his application. For this reason, a Chapter (number 13) is provided for the applicant to include such additional information as he may deem pertinent to his application. Further, under some circumstances certain sections of the Format may not be applicable to a specific application. This should be clearly stated and sufficient information provided to support the conclusion.

Upon completion of the application, it is suggested the applicant use the Table of Contents of this Standard Format as a check-list to ensure that he has addressed each subject and that his application is complete.

STANDARD FORMAT AND CONTENT FOR THE SPECIAL NUCLEAR MATERIALS
CONTROL AND ACCOUNTING SECTION OF THE LICENSE APPLICATION
FOR FUEL REPROCESSING AND CERTAIN SPECIAL NUCLEAR MATERIAL FACILITIES

1.0 ORGANIZATION

Every applicant conducts his business through the medium of an organizational structure. Under varying designations, such as Departments, Sections, or Units, discrete charters of duties, responsibilities, and authorities are assigned to establish not only the component function, but also its relationship to, and interface with, other organizational units. The responses to the subjects raised in this Chapter should be directed toward those specific aspects of the applicant's organization which relate to the control and accounting for Special Nuclear Materials (SNM).

1.1 Management Structure

The applicant's overall management structure should be outlined. In most cases an organization chart should prove to be the most efficient presentation. However, it will generally be necessary to provide sufficient narrative to make the interrelationships clear.

1.1.1 General Description

Describe the principal components of the organization. For the SNM components, provide sufficient information to establish their size and the degree of subdivision or layers of command within each component.

1.1.2 Location of Control Function in Organization

By reference to the organization chart or by description, designate the level(s) of the SNM control function(s); specifically include to whom the responsible organizational unit(s) reports.

1.2 Responsibilities and Authorities

Utilization of SNM generally results in involvement of numerous organizational components, each of which has specific duties, responsibilities, and authority. A description of the management system establishing, maintaining, and providing for these assignments should be provided.

1.2.1 Management

Define the assigned duties, responsibilities, and authority of principal management with respect to SNM. This should include authorized signatures for receiving and shipping documents, routine reports, special investigative reports, etc.

1.2.2 Program Coordinator

Designate a specific person by title as the single official contact on all matters relating to SNM and describe the assigned duties, responsibilities, and authority of his position. Make reference to organization charts and demonstrate sufficient independence from production or SNM custodial functions to permit objective performance of his functions.

1.2.3 SNM Custodial Components

Specify the components which, in the course of their functions, would exercise custody over SNM.

1.2.3.1 SNM Custodian - Designate by position title, for each measured material balance area and item control area established, a single individual as material custodian responsible for all SNM within that area. The duties, responsibilities, and authority of such custodians should be identified and explained. To the extent appropriate, position descriptions should be submitted.

1.2.4 SNM Control Function

Specify that component(s) which in the course of its function would exercise control over SNM.

1.2.4.1 Organization Charter of the SNM Control Function - Submit a copy of the assignment to the SNM component(s) of duties, responsibilities, and authorities. To the extent appropriate, include position descriptions for key positions.

Make specific reference to those charter provisions which evidence a management system to provide for the development, revision, implementation, and enforcement of nuclear material control and accounting procedures.

1.2.5 Separation of Functions

Discuss, on the basis of material submitted in 1.1, 1.1.2, 1.2.3 and 1.2.4, the separation of functions between process and SNM control and between SNM custodial and SNM control functions. In formulating the response it should be recognized that the key point centers on the degree of organizational independence of the SNM control functions and their freedom to make objective decisions.

1.2.6 Support Functions

Define the duties, authority, and responsibilities for such support components as nondestructive assay, analytical laboratories, tool and gage units, storage, shipping and receiving, where such components are separate from production channels. Discuss only those duties, authority, and responsibilities which relate to the control of SNM while in their possession.

1.2.7 Audit Functions

Define the duties, responsibilities, and authority of the organizational unit having as one of its objectives a regularly scheduled review of the SNM control program to ascertain its effectiveness, adequacy of procedures, their implementation, and plant compliance with license requirements. Outline the minimum qualifications of those engaged in the audit function. Describe the extent of independence of this unit from the units responsible for the custody and control over SNM.

1.3 Qualification and Training Program

The duties and responsibilities of the technical and accounting personnel of the SNM control function have been covered in previous sections. Implementation requires assignment of personnel having experience consistent with the duties, authorities, and responsibilities of the respective positions.

The applicant should advise the extent to which training and experience are used as a basis of personnel selection for SNM custodial and control functions. Written exhibits such as position descriptions, descriptions of training programs, review of performance, and refresher programs are all pertinent data and should be furnished in support of the statements made.

1.3.1 Qualification Requirements

Define the qualification requirements utilized by the applicant to evaluate and select personnel for each of the typical jobs identified as required for the SNM custodial and control functions, including the Program Coordinator.

1.3.2 Training Programs

Submit references to, or descriptions of, training programs for employees of the applicant. This should include those programs covering training of personnel involved in the development of original source data used as the basis of entry to the SNM accounting control Records. The development of such source data may involve the use of highly specialized plant equipment such as scales, instrumentation, nondestructive examination equipment,

sampling devices, etc., and execution of these assignments in accordance with Standard Operating Procedures. Describe also the training programs for accounting and technical personnel who would utilize the source data in the material control program.

1.3.3 Retraining and Requalification

Provide a discussion reflecting policy and practice under the circumstances where plant modifications, changes in procedures, or new and improved methods may require retraining and requalification of personnel.

2.0 FACILITY DESCRIPTION

This Chapter is concerned with the type of business of the applicant. Of prime consideration is the involvement with SNM. Responses in the following sections should answer such questions as: how large is the operation; what type or types of SNM are involved; what are the Facility characteristics; what is the Facility layout, its geography, and surroundings. Responses in the appropriate subsections should give an accurate profile of the business, scope, and environment.

A full description of the current processes and operations for each plant in the Facility is needed to assess the acceptability of the physical inventory plan and the material balance model. A plant should be considered as a set of processes or operations coordinated into a single manufacturing, R&D, or testing effort. A scrap recovery operation servicing more than one plant, or offsite customer, should be treated as a separate plant.

2.1 Description of Business

Under this section, the type of business and the extent of the involvement with SNM should be described.

2.1.1 Facility Layout

Describe the general layout of the Facility, define each plant in the Facility, and the location of SNM with relation to ingress and egress. Define by means of schematic drawings, charts, tables, or other submissions, the

distribution of SNM throughout the facility, including shipping, receiving, in-process, and storage. Where organizational lines are crossed by SNM transfers, these facts should be so indicated.

2.1.2 Scope of Involvement with SNM

Identify each SNM which will be handled and, in the case of uranium, describe the levels of enrichment to be involved. Specify the size of operation by material type (SNM) as evidenced by: typical and peak inventory, monthly receipts and shipments, or other pertinent indicators. Reference should be made to drawings, charts, tables, etc. in 2.1.1 and 2.2.2.

2.2 Process

In this section the applicant should provide a sufficient description of the process so that the applicability of the following chapters is apparent and the material balance model (Chapter 12) can be independently evaluated by the AEC regulatory staff.

2.2.1 Description of Process

Describe the process of each plant in terms of feed materials, intermediates, products, recycle scrap, and waste. Additional data deemed significant should be included, such as points where chemical or physical changes take place. Provide similar but separate coverage for each discrete process. Reference to a flow chart (2.2.2) should aid in this description.

2.2.2 Flow Charts

Provide current flow charts and such narrative as necessary to clearly define the process and resulting manipulation of materials. Provide separate coverage for each plant and each discrete process if more than one process is involved. Include on the charts identification of each discrete measurement or sampling point for SNM, as discussed in Chapter 5.

2.2.3 Transfers of SNM to Supporting Services

Indicate, for each type of transfer, the source of material, reason for transfer, principal physical or chemical property, and frequency. Include in such description those transfers of SNM to other custodial departments, such as process to analytical, where analytical is part of a technical department, or process to shipping or receiving, where they are separate functions from processing.

2.3 Equipment and Facilities

In this section, the applicant should describe the important process equipment and measurement facilities used for handling and characterizing SNM.

2.3.1 Facilities and Procedures for Receiving SNM

Describe the procedures for receiving SNM, and the equipment and types of facilities available for handling and processing receipts. Include the capability for handling anticipated flows, the method for confirming receipts,

and the authority to accept and release SNM to the process.

2.3.2 Facilities and Procedures for Shipping SNM

Describe the procedures for shipping SNM, and the equipment and types of facilities for load-out of product and shipment. Include the capability for processing the shipments in terms of capacity for handling anticipated flows, and the control procedures for shipment including authority for release, monitoring in-transit (reference may be made to the section of the application dealing with physical protection of SNM), and confirming receipt.

2.3.3 Types of Process Equipment

For each plant, describe the types of process equipment utilized in the bulk measurement and sampling of SNM, to effect transfers of SNM, and to hold SNM for inventory; in particular, describe the significant chemical or physical forms anticipated to be present in such process equipment. Reference to the process flow chart (2.2.2) may aid in this description; reference may also be made to 5.1.1 and 5.1.2.

2.3.4 Laboratory Facilities and Capabilities

Describe the laboratory facilities available in terms of types of analytical services available, and the capability for processing samples required for process control, quality control, and SNM control and accounting.

Where off-site analytical services are provided, indicate the extent to which

such services are used, both as to coverage and frequency.

For those samples for which analytical results are required for calculation of SNM source data or for physical inventory, indicate the average time results are available after sampling, both for in-house and off-site services.

Reference may be made to Chapter 5.

2.3.4.1 Chemical Test Facilities - Describe the facilities and capabilities for performing chemical tests of SNM.

2.3.4.2 Physical Test Facilities - Describe the facilities and capabilities for performing physical tests of SNM.

2.3.4.3 Nondestructive Assay Facilities - Describe the facilities and capabilities for nondestructive assay of SNM.

2.3.4.4 Off-Site Testing - Describe the examination and testing of SNM provided by off-site facilities.

2.3.5 Storage

Describe the storage capabilities of each plant. Indicate those areas designated as vaults, together with their use, capacity, average inventory, and suitability for monitoring and controlling access, as well as the applicability of tamper-indicating techniques (see Section 10.2.2).

2.3.5.1 Active Storage - Describe the areas, apparatus, equipment, etc. for storage of materials (SNM) for short terms between processing steps. Define the term of such storage.

2.3.5.2 Inactive Storage - Describe the facilities for storage of SNM not actively involved in processing, such as raw materials, product, etc. Tamper-indicating techniques may be of some consideration (see Section 10.2.2).

3.0 MATERIAL CONTROL AREAS

This Chapter concerns itself with the establishment of internal material control areas referred to as material balance areas (MBA) or item control areas (ICA), and the readiness with which a problem can be recognized and the causes isolated. The key to maximized utilization of this approach is a measured input, output, and inventory.

In their most effective application, MBA provide a basis for isolating material losses and detecting errors. Thus, the measured MBA contributes to the physical and administrative control of SNM, and the selection of each MBA should be consistent with these objectives.

A sufficient number of measured MBA should be established so that nuclear material losses, thefts, or diversions can be localized and the mechanisms identified. Ideally, each MBA should constitute an identifiable physical area with appropriate physical barriers such that the quantity of nuclear material being moved into or out of the MBA can be controlled and measured.

The basis criteria for an MBA are: (1) measurability of input, output, and inventory; (2) appropriate sub-division of the plant to isolate losses, theft, or diversion; and (3) SNM custodial responsibility assigned to a single individual.

Item control areas (ICA) should be established according to the same criteria as MBA, except that control into and out of such areas shall be by item identity and count for containers of previously measured SNM quantities. There can

be no manipulation of material within an ICA which would affect the material quantity in identified items.

The basic criteria for an ICA are: (1) the area represents a physically definable portion of the plant; (2) items are uniquely identifiable; (3) the items and/or the area can be sealed with tamper-indicating devices to preclude any unidentified change in the quantity of material in individual items; and (4) the material quantity in each item has been previously measured before such sealing.

3.1 Measured Material Balance Areas (MBA)

By superimposing on the process flow chart (2.2.2), or other suitable means, locate each measured MBA designated in conformity with the objectives specified. Indicate the nomenclature used to identify a specific MBA.

3.1.1 Inputs

Designate by identification number, or other means, and by narrative description, typical inputs to each MBA, including recycle as well as virgin feed.

When material is recycled within the MBA where it was generated, it is not considered as either output or input to that MBA. However, when material is recycled from another MBA, it is an output to one MBA and an input to another. For such cases, where recycle is introduced to an MBA, the applicant should specify the basis of transfer. Also, the impact on MUF for both MBA should be discussed.

3.1.2 Outputs

Designate by identification number or other means, and by narrative description, typical outputs from each MBA, including intermediate and final products, scrap, and waste.

3.1.3 Inventory

List typical inventory categories, and principal chemical or physical form, by designated MBA.

3.2 Item Control Areas (ICA)

Locate, on the process flow chart (2.2.2), the ICA designated in conformity with the objectives specified. Indicate the nomenclature utilized to identify each ICA.

3.2.1 Definition of ICA Items

A review of the process will determine which items will typically conform to ICA classification. Identify such typical items, together with the source of original measurement, and subsequent movement and storage.

3.2.2 Identification Control

Define the control procedures utilized to identify uniquely the items, and to provide the necessary tamper-indicating devices to assure that the material quantities contained therein remain unchanged (see Section 10.2.2).

3.2.3 Verification

Describe in detail the verification procedures for item identity and count which form the basis of input, output, and inventory data for the ICA.

4.0 MEASUREMENT CONTROL PROGRAM

This Chapter concerns itself with the quality of measurements utilized in the control and accounting for SNM. It directs attention to applicant commitments for critical facets of the measurements control program which will be incorporated in the license as license conditions.

Five basic areas of concern for the quality of measurements are:

- (a) the degree of management involvement in measurement quality;
- (b) the training and qualification programs for personnel who perform measurements;
- (c) the development and implementation of a records system for the collection and reporting of generated data;
- (d) the generation of data to determine and to control measurement error; and,
- (e) the development and implementation of a system to evaluate the data, including statistical analysis.

4.1 Management Responsibilities

The applicant should describe in this section the involvement of management in the measurement control program.

4.1.1 Program Control

Describe management responsibility for the review and approval of the procedures, and modifications, of the material control program. As appropriate,

reference may be made to Section 1.2.

4.1.2 Program Audit

Identify the responsibility for review and audit of the measurement program for purposes of ascertaining the current status and effectiveness of the SNM measurements system. Describe the scope and frequency of these reviews and audits and the distribution and disposition of the reports resulting therefrom. To the extent appropriate, reference may be made to 1.2.7.

4.2 Responsibilities of Program Coordinator

Under 1.2, the applicant's responsibility for appointing a specific person as the official contact on all matters pertaining to SNM was discussed. The responsibilities of the Program Coordinator for planning, developing, coordinating, and administering the measurement control program should be defined in this Section.

4.3 Qualification and Training

Under 1.3, Qualification and Training Program, the basic requirement for defining job qualifications and assigning personnel adequately trained for their functions was discussed. Under this section, the applicant should describe the qualification and training program specifically developed for measurements used in SNM control. Describe the steps taken to assure that measurements are performed by personnel adequately trained and qualified. In addition, provide

an outline of the training program, referring to published documents where practical.

4.4 Measurement Records System

This section should deal only with those records associated with measurements which are subsidiary to the records described in Chapter 9.0. Detail the source data forms used (such as tally sheets, analytical requisitions, etc.) to support the limit of error (LE) determinations, detail how or by what system such data flow to the measurement records system, what that system consists of in terms of accounts or information, and how the data are summarized for statistical evaluation purposes.

4.5 Standard Operating Procedures (SOP)

A measurement program requires a standardized system of procedures whereby the performance conforms to prescribed controls. If repetitive samples are taken at a point in the process, then all samples must be taken in conformity with the SOP for sampling at that point. In most cases there is a complementary source data sheet to be filled in by the operator or analyst, creating a record of compliance with the SOP. Thus, if an SOP calls for a specific re-circulation time before a sample is taken, the source data sheet would show the time circulation started and stopped to demonstrate conformance to the SOP.

Most SOP involve the cooperation of several components: process, SNM control, analytical, statistical, etc., and incorporate the results of engineering tests and evaluations to determine such questions as time, temperature, measurement conditions, number of samples, etc. Thus, it is important that the development and revision of SOP be carefully controlled.

4.5.1 Development of SOP

Define the responsibility and authority of the component responsible for the development of measurement SOP, including coordination of interfaces with other affected components. Describe the number and identity of authorized signatories required for issuance of an SOP. As appropriate, reference 1.0, 4.1, etc.

4.5.2 Control of Revisions to SOP

Define the responsibility and authority of the component responsible for the revision of measurement SOP, including identity of authorized signatories. Reference should be made to 1.0 and 4.1, as appropriate. Describe the system of document control for the distribution of revised SOP to assure that all affected groups receive the revisions and that all obsolete procedures are retrieved.

4.5.3 Confirmation of Implementation of SOP

Describe those procedures which are employed to confirm that SOP are routinely implemented, including the scope of review of documentation which supports the implementation of the SOP. Reference may be made to 1.0 and 4.1, as appropriate.

4.6 Measurement Error

In this section, the applicant should discuss those measures taken to establish

a system for generating procedures to develop limits of error (LE) for all important measurements and for reviewing their implementation. The LE for a quantity of SNM is composed of the statistical summation of random and systematic errors of all components (such as bulk measurement, sampling, analytical) contributing to the determination of the quantity.

4.6.1 LE Procedures

Describe in this section the procedures for assuring the establishment of the LE for important measurements and the routine generation of required data. Identify the measures taken to assure a current, valid LE for important measurements. Identify by position title the individual(s) responsible for these activities.

4.6.2 Procedures Review

Define the responsibility for reviewing the implementation of procedures for determining and controlling bias, systematic error, and random error in measurements, including identification, by position title, of the individual(s) responsible. Include frequency of review, and corrective action taken when a bias is identified and quantified.

4.7 Contractor Compliance

Should the applicant use outside measurement services to perform material control and accounting measurements, the contracted services should conform with the material control program described herein for the applicant. Describe

those steps taken to provide for such conformance.

4.8 Adequacy of Contractor Program

In order to confirm the adequacy of compliance of a contractor's program, the applicant should perform regular reviews of the contractor's measurement control program. Describe the procedures established to confirm compliance of the contractor's measurement control program with the requirements of the applicant.

5.0 MEASUREMENTS AND PROCEDURES

This Chapter addresses the measurements needed for control and accounting of SNM. In addition, it concerns itself with the control of the conditions under which such measurement functions are performed (Standard Operating Procedures), and with the supporting checks and procedures devised to identify and quantify the random and systematic errors, correct for bias, and to assure the quality of measurement results.

5.1 Measurement Methods

The applicant should provide a detailed definition of his measurement program for determining quantities of SNM, including isotopic assay for U-235. The response should define the method of measurements to be made and their associated random and systematic errors for each material type in each plant, and the applications of the method in each plant, keyed to the flow chart discussed in 2.2.2. This may take the form of a table or chart which lists each unique measurement method, including sampling method, its LE (see 4.6), and identifies each point in the process (using the flow chart in 2.2.2) where such a measurement is made. Sufficient information should be provided to permit an independent evaluation of the material balance model discussed in Chapter 12.0. To the extent the information requested in this section is published (e.g., a Procedure Manual) and attached to the application, the published information may be referenced. The procedures used to obtain random and systematic error data should be described; the statistical treatment of the data should be covered in Chapter 6.0.

5.1.1 Bulk Measurements

For each bulk measurement (weight, volume) identified in 5.1, describe the method of making the measurement, and the equipment utilized. Reference the engineering tests and evaluations qualifying the method.

5.1.1.1 Calibration of Bulk Measurement - Describe the method used to calibrate the bulk measurement. Identify the standards used and their traceability to certified standards. Reference the engineering analyses and evaluations justifying the calibration procedures.

5.1.1.2 Establishment of LE for Bulk Measurements - Describe the procedures used to determine the random and systematic error associated with the bulk measurement. Describe the procedures used to identify and quantify bias and the method used to correct for bias. If the LE data are not generated in a current material balance period, describe the tests made to assure that historical data are valid and currently applicable.

5.1.1.3 Bulk Measurement Control - Identify the procedures used to monitor the bulk measurements to assure they are maintained in control (such as the use of check weights and control charts). Describe the typical frequency with which such data are generated and tested, and the criteria which require re-calibration.

5.1.2 Sampling Methods

For each sampling method, describe the procedures for obtaining the sample, including the number of samples taken for each measurement. Include any

special steps taken to prepare the material for sampling, such as blending, or to preserve the sample against deterioration such as dilution, desiccant, inert atmosphere, etc. Reference the engineering tests and evaluations which qualify the sampling method.

5.1.2.1 Sampling Facilities - Describe the sampling facilities and auxiliary equipment employed to obtain a sample; e.g., glove box, isolated sample room, air lift, thief, blender, air sparge, etc. Describe engineering analyses or evaluations of equipment design, or pre-operational testing, which qualify the facilities.

5.1.2.2 Calibration of Sampling Equipment - Describe the method used to calibrate sampling equipment (such as pipettes). Identify the standards used and their traceability to certified standards. Reference the engineering analyses and evaluations supporting the calibration procedures.

5.1.2.3 Sample Characteristics - For each sampling method identified herein, describe the principal physical and chemical state of the SNM; e.g., solid, liquid, powder, composition, concentration range, etc.

5.1.2.4 Sample Identification - Describe the methods used to identify the sample and to provide traceability to the batch or lot of material sampled, including, as appropriate, the record of sampling conditions such as temperature, density, etc.

5.1.2.5 Establishment of LE for Sampling - Describe the procedures used to determine the random and systematic error associated with each sampling method. Describe the procedures used to identify and quantify bias and the

method used to correct for sampling bias. If the LE data are not generated in a current material balance period, describe the tests made to assure that historical data are valid and currently applicable.

5.1.2.6 Sampling Control - Identify the procedures used to monitor the sampling methods to assure they are maintained in control (such as the use of replicate samples, control charts, etc.). Describe the frequency with which such data are typically generated. Identify the criteria which require re-calibration of sampling equipment.

5.1.2.7 Time Factor - Identify, for each sampling method, the time span between sampling and receipt of the results of analysis.

5.1.3 Analytical Techniques

In general, analytical services are provided by a unit organizationally separate from the custodial or control components. In other cases, such services are provided by an outside source. In either case, an Analytical Laboratory Manual should provide descriptive information covering all analytical procedures, including isotopic assay for U-235, used for control and accounting of SNM. To the extent the Manual covers the following information, it may be referenced and attached as an exhibit. The applicant is referred to Division 5 Regulatory Guides, especially numbers 5.4, 5.5, and 5.6.

5.1.3.1 Identification of Laboratory Samples and Reports - Discuss the laboratory records system which controls sample receipts and analytical reports. Describe the procedure which identifies a sample submitted to the laboratory and which enables the laboratory report to be tied to related source data, such as

bulk measurement, sampling conditions (temperature, density), etc.

5.1.3.2 Analytical Methods - For each analytical measurement identified herein, including isotopic assay for U-235, describe the analytical methods employed in the analysis of SNM samples. Include procedures for sample preparation (including sub-sampling), number of samples analyzed, the basic analytical procedure used, special equipment required, calculational methods employed (including the checking of calculations), and the nature of the information in the analytical report (g/g, g/ml, atom percent, etc.). Reference may be made to an Analytical Laboratory Manual if it accompanies the application.

For those bulk measurements and sampling methods used in the laboratory, the information requested in 5.1.1 and 5.1.2 should be provided.

For special equipment employed, reference the engineering analysis, evaluation, or tests used to qualify the equipment.

5.1.3.3 Calibration and Standardization - Describe the methods used to calibrate equipment or standardize solutions used in the analytical methods. Identify the standards used and their traceability to certified standards. Reference the engineering analyses or evaluations which support the calibration methods.

5.1.3.4 Establishment of LE for Analytical Methods - Describe the procedures used to determine the random and systematic errors associated with the analytical methods, including the number of replicate determinations made. Describe the procedures used to identify and quantify bias and the method used to correct for bias. Include in the discussion all sources of error such as

weighing, volumetric, sampling, operator, etc. If the LE is accumulated from the LE of the components, discuss the sources of co-variance which are considered. If the LE data are not generated in a current material balance period, describe the tests made to assure that historical data are valid and currently applicable.

5.1.3.5 Analytical Control - Identify the procedures used to monitor each analytical method to assure that it is maintained in control (such as the use of control samples, disguised samples, control charts, standards, etc.). Describe the frequency with which such data are generated and tested, and the criteria which require re-calibration or re-standardization.

5.1.4 Nondestructive Assay

For each nondestructive assay method identified in 5.1 used to measure SNM, describe the method of measurement, including the equipment utilized. The importance of standards typical of the matrix, SNM distribution, container, etc., to be measured should be recognized. Reference the engineering tests and evaluations which qualify the measurement method. The applicant is referred to Division 5 Regulatory Guide numbers 5.9 and 5.11.

5.1.4.1 Calibration of Nondestructive Assay Equipment - Describe the method used to calibrate the nondestructive assay equipment used to measure SNM. Identify the standards used and their traceability to certified standards. Reference the engineering analysis or evaluation which supports the calibration procedures.

5.1.4.2 Establishment of LE for Nondestructive Measurements - Describe the procedures used to determine the random and systematic error associated with the

nondestructive measurements. Describe the procedures used to identify and quantify bias and the method used to correct for bias. If the LE data are not generated in a current material balance period, describe the tests made to assure that historical data are valid and currently applicable.

5.1.4.3 Nondestructive Measurement Control - Identify the procedures used to monitor the nondestructive measurements of SNM to assure they are maintained in control (such as use of working standards, control charts, etc.). Identify the frequency with which such data are generated and tested, and the criteria which require re-calibration.

5.2 Control of Reference Data

Describe the procedure for the control of calibration data, elimination of obsolete charts, and review of applicable SOP, and control of the distribution of replacement data, charts, and procedures. Reference 4.5.2, as appropriate.

5.3 Equipment Modification

Describe the procedure for management notification and authorization for modifications to equipment used in the measurement of SNM, including review and possible revision of SOP. Outline the policy and practice regarding re-calibration subsequent to modifications of such equipment.

5.4 Calibration Control

Where re-calibration is performed on a routine frequency, describe the procedures to assure that the calibration is accomplished in a timely manner,

including the use of calibration stickers, calibration notification memos, etc., and that calibration control data accumulated pursuant to 5.1 is not overlooked or compromised.

5.5 Factors

Under exceptional circumstances, a direct measurement of SNM may be impossible, and it will be necessary to rely upon factors developed by engineering studies. For those factors identified in 5.2 and used in the control and accounting of SNM, describe the method of determining the factor. Reference the engineering analysis or evaluation which supports the use of the factor.

5.5.1 Determination of LE for Factors

Describe the procedures used for determining the random and systematic error associated with the factors used in the control and accounting of SNM. Describe the procedures used in identifying and quantifying bias, and the methods used to correct for bias. If the LE data are not generated during a current material balance period, describe the tests made to assure that the historical data are valid and currently applicable.

5.5.2 Control of Factors

Describe the procedures used to monitor factors to assure that they are maintained in control. Identify the frequency with which control data are generated and tested, and the criteria which require a review and revision of a factor.

6.0 STATISTICAL SYSTEM

As provided by 10CFR70, the comparison of MUF with the LEMUF provides the primary test for judging whether a particular value of MUF is significantly different from zero. The concern is whether or not the MUF involves a real loss or gain of material. The validity of the test is dependent upon a high quality Measurement Control Program.

Portions of the criteria for such a program are covered in other Chapters (4.0 and 5.0) dealing with measurements. Two remaining considerations involve: (1) techniques for defining the size and source of measurement error, and (2) the creation of quantitative methods for interpreting accounting data in the light of measurement limitations. The procedures for handling these are provided by a statistical system, the scope of which is fundamental to judgment of the adequacy of the control system.

To the extent that the information has been published (e.g., in a statistical manual), the information required in the following Sections may reference the specific paragraphs in the publication and the publication be enclosed with the license application. The applicant is referred to Division 5 Regulatory Guide number 5.3.

6.1 Responsibilities for the Statistical System

In this Section, identify those individuals and units responsible for the development, approval, implementation, and maintenance of the statistical system. Reference should be made to Chapter 1.0, where appropriate.

6.1.1 SNM Component

Identify those individuals in the SNM component engaged in the development, approval, implementation, or maintenance of the statistical system, and define their responsibilities and authority. Describe the qualifications prescribed for such personnel. As appropriate, reference Chapter 1.0.

6.1.2 Statistical Services

Describe the extent statistical services are provided by other components in the company or by independent consultants. Briefly describe the procedures by which the scope of such services are prescribed and the mechanisms employed to control the quality of the services.

6.2 Scope of Program

In this Section the applicant should define the scope of his statistical program. To the extent pertinent, reference should be made to Chapters 4.0 and 5.0, and to any publications enclosed.

6.2.1 Random Error

Describe the procedures used to process data generated by the procedures described in Chapter 5.0 to identify and quantify random error in measurement methods. This discussion should include the steps taken to identify measurement co-variance. The discussion should clearly identify the statistical techniques employed.

6.2.2 Systematic Error

Describe the methods used to process the data generated by the procedures described in Chapter 5.0 to identify and quantify the systematic errors associated with each measurement in each plant.

6.2.3 Error Propagation

Describe the techniques for accumulating, from the various random and systematic errors described in Chapter 5.0 and discussed in 6.2.1 and 6.2.2, the LE associated with the MUF of the material balance. Describe the procedures used to assure that measurement and item co-variant terms do not improperly enter the error propagation.

6.2.4 Bias

Describe the methods used to process the data generated by the procedures in Chapter 5.0 to identify, quantify, and correct for bias in the measurement system so that it does not enter the material balance.

6.3 Data Processing

Describe the techniques and the equipment utilized for processing the data generated for the statistical program. Identify the capabilities of any electronic data processing equipment used and of any generally recognized programs employed.

6.4 Review of Statistical System

Describe the program of review employed to assure that the statistical program is properly implemented, that the procedures are current and approved, and that modifications are accomplished in a timely and appropriate manner. Reference may be made to Chapters 1.0, 4.0, and 5.0, as appropriate.

7.0 PHYSICAL INVENTORIES

In this Chapter, the applicant should describe the planning, scheduling, execution, and reconciliation to be followed for physical inventories of SNM. Division 5 Regulatory Guide number 5.13, "Conduct of Nuclear Material Physical Inventories", provides guidance to licensees and applicants relative to the requirements in 10CFR70.

The American National Standard N 15.3, "Physical Inventories of Nuclear Materials", also outlines fundamental steps to be taken to obtain adequate physical inventories of nuclear materials.

7.1 General Description of a Typical Inventory

Each applicant should submit information describing a typical physical inventory for each material control area and plant. The information should include typical quantities (including batch size) and types of materials expected to be in each MBA, in process, under tamper-indicating procedures, and as unopened receipts or as ultimate product. As appropriate, reference 3.1.3. The information should also include the types of physical inventories typically to be performed for material in process, including the extent of plant or process shut-down and clean-out. Should the applicant perform portions of the physical inventory while process material is in a dynamic state, the information should include the extent to which, typically, the inventory would use such techniques as Process Blank, Tracer or Step Function, Counter-Current, or Process Parameter (see Regulatory Guide 5.13). Sufficient information should be provided to permit an independent evaluation of the material balance model discussed in Chapter 12.0.

7.2 Inventory Planning

In order to assure that each physical inventory of SNM results in complete and accurate data and in minimal interference with plant operations, it is necessary that written physical inventory procedures be prepared. These procedures must identify those persons to be involved in the inventory, define their responsibilities, and explain the specific actions to be followed. To be sure that all persons and organizations involved are fully cognizant of their responsibilities, pertinent sections should be made available for their review well in advance of the stipulated inventory time.

In developing his inventory procedures, the licensee should incorporate appropriate administrative and physical actions to assure an adequate inventory.

Since the processing, location, quantities, and forms of materials to be inventoried may differ widely for different SNM types (plutonium, enriched uranium, etc.), the applicant should assure that the inventory plan provide for such separate procedures for each type of material as are necessary to result in an orderly, complete, and accurate inventory. The plan should also recognize the differences in procedures which may be necessary when inventorying material balance areas and item control areas.

7.2.1 Preparation of Procedures

Confirm that there will be written procedures for each physical inventory, and describe how they will be prepared, or modified, and disseminated to the concerned persons and organizations. Specify the physical inventory schedule

for each plant. Discuss, as supporting information, any special considerations which affect the selection of inventory schedules.

7.2.2 Organization

Affirm that the written inventory instructions will identify the various persons and organizational units to be involved in each physical inventory and that their duties and responsibilities will be set forth therein.

7.2.3 Physical Inventory Supervisor

Describe the basis to be used by the applicant in naming the physical inventory supervisor, including the extent of his experience and familiarity with the areas to be inventoried, and with the principles of conducting physical inventories. The typical relationship of such a person to (1) material custodians, (2) those persons maintaining the perpetual inventory records, and (3) operating supervisors, should also be described.

7.2.4 Inventory Team

Discuss the make-up of a typical team or group to engage in the conduct of the physical inventory, including the extent to which such persons are familiar with the area (IIBA/ICA) being inventoried and, where materials are to be handled or measured, the extent to which the team would typically include persons familiar with such activities.

7.2.5 Reconciliation

In assigning physical inventory responsibilities, advise the extent to which the person responsible for reconciling the physical inventory data with the perpetual inventory records is related, organizationally, to: (1) material custodians, (2) those who maintain the perpetual inventory records, and (3) operating supervisors.

7.3 Inventory Preparation - Administrative

For a physical inventory to be complete and accurate, it is necessary that every effort be made to eliminate errors, both of omission and commission. The applicant's physical inventory preparations should, therefore, include such administrative steps as are necessary to achieve an accurate physical inventory.

7.3.1 Measured Values

Describe the procedures used to assure that the SNM quantity associated with each inventory item is a measured value.

7.3.2 Identification of Inventory Items

Describe the techniques used by the applicant to assure that all items to be listed are identified in such a manner as to aid in assuring that none are omitted and none are listed more than once. The applicant should also discuss the procedures whereby the pre-inventory planning and preparation are reviewed and the inventory listings are confirmed for completeness and accuracy of the

calculations, extensions, and footings.

7.3.3 Cutoff Procedures - Materials

Describe the cutoff procedures for transferring and processing materials to assure an accurate inventory. The applicant should describe the controls to be exercised over SNM movements into or out of an MBA, ICA, or the plant as a whole. Also, the extent to which exceptions to such procedures are to be permitted and controlled should also be described.

7.3.4 Cutoff Procedures - Records

Describe the procedures whereby the applicant will assure that the material accounting records include all entries for transactions up to the inventory time and that subsequent transactions have been excluded.

7.3.5 Standard Operating Procedures

Discuss the extent to which inventory procedures, be they weighing, volume, sampling, tag identification, or any other required procedures, follow Standard Operating Procedures (SOP), and the extent to which the inventory participants certify to the fact that the actions taken conformed to the SOP applicable.

7.4 Inventory Preparation - Physical

For a physical inventory to be complete and accurate, it is essential that certain physical actions be taken prior to the stipulated inventory time.

The applicant's physical inventory preparation should, therefore, include the following steps.

7.4.1 Material In Process

7.4.1.1 Shut-down Inventory - Identify those process vessels or pieces of equipment which will be shut down, cleaned out, and/or remain static for purposes of the physical inventory. The applicant should provide an estimate of the inventory, if any, which will remain in each vessel or piece of equipment (heels). Describe the methods used to ascertain the SNM content of heels of process vessels which cannot be completely emptied for inventory. Reference the engineering tests, analysis, or evaluation which supports the method.

7.4.1.2 Dynamic Inventory - Describe, for each process vessel or type of equipment, which will not be inventoried as in 7.4.1.1, the type of inventory to be taken (see 7.1). State how the interface between the static and dynamic portions will be controlled.

7.4.1.3 Process Holdup - Characterize the material remaining in processing lines, equipment, and vessels in each plant at the time of inventory and define the procedures for measuring such materials. State the extent to which the inventory will be reduced and processed to a measurable state, and the types of measurements to be made. The applicant is referred to Division 5 Regulatory Guide number 5.8.

7.4.2 Sealed Sources, Containers, Vaults

7.4.2.1 Identification - Describe the procedures whereby the applicant will assure that all sealed sources, containers, and vaults have been accurately located and identified prior to the physical inventory.

7.4.2.2 Tamper-Indicating Devices - Describe the procedures for verifying the integrity of the tamper-indicating devices for such items and the steps to be taken should the integrity of the tamper-indicating devices be found to have been compromised. For violations determined to be significant, the actions should be discussed in 11.5.

7.4.3 Pre-Inventory Inspection

Describe the procedures to be followed by the applicant to assure that the MBA and the ICA are prepared for the physical inventory. Such description should discuss procedures for assuring that all items are appropriately labeled with current inventory data; scales and other measuring devices to be used in the physical inventory are in current calibration (see appropriate sections of Chapter 5); and, sample containers and other necessary equipment are available in accordance with the SOP.

7.4.4 Inventory Measurements

7.4.4.1 Previously Made Measurements - Identify the basis for accepting previously made measurements and their random and systematic errors.

7.4.4.2 Current Measurements - Designate the typical measurements which will be made for current inventories. Include nondestructive assay, bulk measurements, sampling methods, chemical analyses, and isotopic assay for U-235.

7.4.4.3 Use of Factors - State the basis for the use of factors (see 5.1.6), referencing the engineering tests or evaluations for measurements supporting their use.

7.5 Conduct of Inventory

Upon completion of the inventory plan, assignments, and pre-inventory preparation, the physical inventory should proceed in accordance therewith.

7.5.1 Deviations from Procedures

The applicant should discuss the extent to which deviations in inventory procedures will be approved, by whom, and the circumstances under which they occur.

7.5.2 Source Data

Describe how data will be collected and documented to assure that all items on inventory can be traced to measurements.

7.5.3 Inventory Data Sheets

The applicant should describe the controls to be exercised over the distribution of and use of inventory sheets on which the items of inventory will be listed.

7.6 Post-Inventory Activities

Upon completion of the physical inventory listings for each MBA/ICA and the plant total, provision must be made for reconciliation with the balances of those accounts in the material accounting records, and, where differences are found, to adjust the records to agree with the physical inventory.

7.6.1 Inventory Acceptability

Describe the extent to which the applicant has provided for a review of the physical inventory to ascertain if it was taken in accordance with procedures and if the results conform to management's pre-established criteria.

7.6.2 Reconciliation

Describe the procedures whereby the physical inventory will be reconciled with the perpetual inventory records. Include in such description, the extent to which the applicant will provide for confirming that all analytical data have been received and entered, that computations are correctly made, that all required extensions of line items have been made, that all inventory sheets are totaled, and that such calculations have been double-checked.

7.6.3 Adjustments

Identify the procedures for preparation of inventory adjustments and entering of such adjustments into the material accounting records. Describe the extent to which such adjustments are approved by management.

7.6.4 Management Reports

The applicant should discuss the extent of reports made to management on the results of the physical inventory, including whether the inventory is within the prior-established acceptance criteria (see 7.6.1).

7.6.5 Unusual Incidents

Detail the notification procedures in the event the physical inventory discloses evidence of unusual incidents such as ICA piece count discrepancy, vault or tamper-indicating violations, and tag or label alterations or disfigurements.

Include action procedures in the event of operational difficulties, such as instrumentation malfunction, duplication of entry, difficulties in locating material or identification, leaks, or other problems which may have arisen during the conduct of the inventory. Actions taken for major occurrences should be covered in Chapter 11.0.

8.0 SCRAP AND WASTE CONTROL

One of the major potential sources of SNM control problems may result from the fact that processing generates side-stream flows of scrap and waste. These materials may be heterogeneous and, thus, less amenable to sampling or other conventional measurement techniques. Consequently, they frequently constitute a major contributor to unacceptable LEMUF or MUF for a material balance. In the Subsections below, detail the information describing the approaches to be used by the applicant in resolving these potential problems. The applicant is referred to Division 5 Regulatory Guide number 5.2.

8.1 Sources

The applicant should provide typical scrap and waste categories and their sources, and identify those which might appear on a typical physical inventory, together with their associated random and systematic errors. As appropriate, reference 3.1.3, 5.0, and 7.1.

8.1.1 Internally Generated

Identify typical scrap and waste generated internally by type, relative quantity, source (MBA) and subsequent routing of scrap to current recycle, storage of scrap for future recycle, off-plant shipment of scrap for recovery, or disposal of wastes.

8.1.2 Externally Generated

Provide information as to the typical types, relative quantities, and frequency

of receipts in the event scrap is received from off-site. Detail the flow after receipt and ultimate disposition.

8.2 Off-Plant Shipments

Provide a description of the type or types of scrap typically shipped off-site, including a summary history of S/R differences, if available. Detail procedures for utilizing feed-back information.

8.3 Limit of Error

Describe the procedures to assure that the LE attributable to scrap and waste does not exceed 30% of each plant LEMUF, in accordance with paragraph 70.58 (i)(4) of 10CFR70.

8.4 Storage

The facilities utilized to store scrap and waste material and the procedures used for their control should be described.

8.4.1 Facilities

Describe the facilities for storage of scrap materials, or any waste materials not promptly discarded. Where open storage is contemplated, describe the facilities and the controls utilized to assure that a limit of 0.25 g/l is not exceeded in accordance with Paragraph 73.60 (a) (4) of 10CFR73.

8.4.2 Procedures

Detail the procedures used to organize and control the storage of scrap material

including the use of color codes, identification procedures, vault storage, or other means to expedite the performance of accurate physical inventories.

8.5 Time Limitations

Describe the procedures for processing and recovery of scrap and for disposing of wastes whereby the applicant can assure that (a) no item of scrap remains on inventory longer than three months, and (b) that disposable waste is removed from inventory within three months, in accordance with Paragraph 70.58(i) of 10CFR70, unless otherwise specifically authorized by the AEC.

9.0 MATERIALS ACCOUNTING SYSTEM

This Chapter concerns itself with the centralized materials accounting system. Subjects of interest include description of the double entry accounting procedures and the establishment of a chart of accounts, including perpetual inventory accounts. The objectives of the materials accounting system are to provide current and accurate information as to the receipts, shipments, and inventory of special nuclear materials and to the quantity and source of apparent losses. The system should include subsidiary accounts for each measured material balance area and item control area as well as procedures for reconciling subsidiary accounts to control accounts at the end of each accounting period. Procedures should also be provided covering the adjustment of book inventory values to physical inventory values.

Should the applicant's materials accounting system be documented in a Procedures Manual, such Manual may be submitted with the application. Specific references should be made in each subsection below to the pertinent sections of the Manual.

9.1 System Description

Describe the double entry records system in terms of the general and subsidiary ledgers and journals, together with a chart of accounts, including the way in which records of additions to and removals from the process, together with the inventories of material in process, will be identified. Should the chart of accounts be set up by project, or any designation other than by MBA/ICA, provide a correlation of such accounts to the MBA/ICA or vice versa.

9.2 Electronic Data Processing Capabilities

Define the extent to which SNM reports, accounts, or inventory data are processed by electronic data processing systems.

9.3 Source Data

Define the specific source data which will be used as the basis of entries to the records. Such information should cover external receipts and shipments, internal transfers between MBA and ICA, waste or scrap transfers or removal, inventories, and adjustments to any of these.

9.4 Adjustments to Records

Describe the methods whereby adjustments to prior recorded values are made, including the forms or records used and the approvals necessary.

9.5 Documents - Forms

Copies of all current documents and forms involved in accounting for special nuclear materials should be provided in support of the materials accounting system. For each, provide the scope of action required to complete and post, and describe the disposition of the documents and forms.

9.6 Standard Operating Procedures for Accounting System Routines

Describe the procedures in use for the control of accounting routines such as posting, totaling, balancing, etc.

9.7 Report Preparation Procedures

Detail the procedures for report preparation, identifying how they are checked for completeness, who prepares them, and who approves them.

9.8 Records Storage and Retention

Describe the storage and retention practices for SNM Records and Reports, including physical form, to assure meeting requirements of 10CFR70.51(e)(4)(iii), (iv), and (v). Detail retrieval procedures, including access control.

10.0 INTERNAL CONTROLS

This Chapter directs attention to the practices and procedures developed by the applicant to assure compliance with management requirements and to minimize the frequency of undetected errors. Such practices and procedures should be described for the applicant's Material Control Program. Where certain internal controls are described in other Chapters, references may be made thereto, as practical; otherwise, full details should be provided in this Chapter.

10.1 Segregation of Material Types

Detail the extent to which material types and U-235 enrichments are segregated. In addition, discuss the handling and labeling of materials to assure segregation during storage and movement.

10.2 Control of Storage

The applicant should detail the controls exercised over SNM storage areas, including discussions of container and vault seals, tamper-indicating devices, controls over ingress and egress, and associated records.

10.2.1 Containers and Vaults

Provide a listing and description of the types of containers, vaults, and other storage areas in which materials are stored.

10.2.2 Tamper-Indicating Devices

Provide a listing and description, including the tamper-indicating features, of

the types of devices used for the vaults and containers discussed in 10.2.1. Design information should be submitted, as appropriate. For pressure-sensitive seals, refer to Division 5 Regulatory Guide number 5.10.

10.2.2.1 Application - Indicate how each type of device is to be applied to assure the protection of the various types of containers and vaults.

10.2.2.2 Identification - Describe the identification system to be used for the tamper-indicating devices.

10.2.2.3 Access - Discuss the plan to be employed for limiting personnel access to the tamper-indicating devices prior to issuance.

10.2.2.4 Control - Provide information about the program to be employed in the issuance, application, and disposal of the tamper-indicating devices. Discuss how the control officer assures that the devices are properly applied, including the recording of time and location.

10.2.2.5 Records of Tamper-Indicating Devices - Describe the record system to be used for the control and application of the tamper-indicating devices.

10.2.2.6 Records of SNM Quantities - Describe the records system to be used which shows the identity, location, and quantity of SNM associated with each tamper-indicating device.

10.2.2.7 Monitoring Program - Explain the monitoring program for periodically verifying the presence and integrity of tamper-indicating devices in use.

10.2.2.8 Response - State the plan of action to be followed when it has been determined that the integrity of a tamper-indicating device has been

compromised. For significant violations, see 11.5.

10.3 Internal Transfers

Describe the controls exercised to assure that original source data documents are executed at the time SNM pass to or from an MBA or an ICA, and that such data are entered promptly and accurately into the records system.

10.4 Control of Documentation

The applicant should discuss his control over the use and disposition of documents and forms used in the development of material accounting data.

10.4.1 Issuance, Use, and Disposition

Describe the means used to control the issuance, use, and disposition of documents and forms used in the material accounting system, such as those for internal and external transfers, inventory tags, inventory listing sheets, and analytical requisitions.

10.4.2 Signatures

Specify the signature requirements on all documents discussed by the applicant in 10.4.1.

10.4.3 Data Changes

Describe the controls used to assure that changes to data entered on the documents discussed are made only under authorized circumstances.

10.5 System Changes

Specify the procedures established to assure that changes to the material control system are properly authorized, that involved parties are consulted and notified, that proper revisions are made to internal instructions and the material control manual, and that adequate publicity of the changes is made. Where the changes involve license conditions, state the steps whereby management assures that such changes are implemented.

10.6 Internal Audits

Describe the program of internal audits followed by the applicant. Include frequency, general scope, organization responsible for audits, distribution of reports, and follow-up procedures. Reference should be made to 1.2.7, 4.1, 5.1.3, and 6.4, as appropriate.

10.7 Miscellaneous

The applicant should discuss here, by reference or otherwise, other internal controls not covered above, which demonstrate steps taken to guard against errors of omission and commission.

11.0 ACTIONS - MAJOR OCCURRENCES

In this Chapter, the applicant should describe the responsibilities for initiating and following through on actions to be taken when there is a major occurrence violating one or more of the significant controls. For those major occurrences listed below describe:

- a. The specific actions to be taken, including persons and organizations to be notified when the occurrence is first noted.
- b. The individuals responsible for initiating and following through to a conclusion.
- c. The circumstances under which the occurrence is brought to the attention of management and appropriate governmental and regulatory bodies.
- d. The types of reports (written, oral, telephonic), including the circumstances calling for "Initial", "Status", and "Final" reports.
- e. Corrective action to be taken.

11.1 Exceptional LEMUF

Define the criteria for establishing that a calculated LEMUF is exceptional and warrants investigation.

11.2 Significant MUF

Define the criteria for establishing that the calculated MUF is significant and

warrants investigation.

11.3 Significant Shipper/Receiver Discrepancy

Define the criteria for establishing that a shipper/receiver discrepancy is significant. For a significant shipper/receiver discrepancy, also describe the methods employed for reconciling such difference (i.e., determining what records should be adjusted and in what fashion).

11.4 Item Count Discrepancy

For any circumstance when an identifiable item is determined to be missing, describe the actions to be taken.

11.5 Significant Tamper-Indicating Violation

Define the criteria for establishing that a tamper-indicating violation is significant and warrants investigation. For a significant tamper-indicating violation, describe the actions to be taken.

12.0 MATERIAL BALANCE MODEL

One of the recurring responsibilities of the SNM component involves the preparation of a material balance. The applicant should identify typical flows into and out of each MBA and plant. The preparation of a typical material balance model for each MBA and plant should be described. In those instances where the LEMUF is accumulated by a summation by source types, the LE information need not be included in 12.2.1, 12.2.2, 12.2.3, and 12.2.4, but must be provided in 12.3.

12.1 Typical Flows

Using the process flow chart defined in 2.2, identify typical flows into and out of each MBA and plant. Identify the quantity, batch size, number of batches, and material types involved with each input or output, including recycle material which originates outside an MBA (for MBA flows) or plant (for plant flows), and on inventory. To the extent applicable, refer to Chapters 3.0, 5.0, and 7.0.

12.2 Frequency

Define the frequency at which a material balance for SNM will be prepared for each MBA and plant.

12.2.1 Beginning Inventory (BI)

Specify the quantity of SNM on inventory at the start of a typical material balance period as defined in 12.2. For the material types and quantities on

hand as described in 3.1.3 and 7.1, indicate the LE associated with the beginning inventory for each MBA and plant.

12.2.2 Additions to Material In Process (A)

For the period defined in 12.2, specify the quantity of SNM typically introduced to each MBA and plant, including virgin and recycle materials. Include recycle material only if it originates outside the MBA (for MBA inputs) or plant (for plant inputs). Indicate the material types and quantities and the LE associated with the components of A and the total LE for A.

12.2.3 Removals From Material In Process (R)

For the period defined in 12.2, specify the quantity of SNM typically removed from each MBA and plant. Include in R products, waste, and scrap, and rework or recycle materials if removed to another MBA (for MBA removals) or another plant (for plant removals). Removals should be sufficiently different from additions to reflect typical process variations. Identify the material types and quantities for each removal and the LE associated with the components of R and the total LE for R.

12.2.4 Ending Inventory (EI)

Specify the quantity of SNM typically on inventory at the end of the period defined in 12.2. EI should be sufficiently different from BI to reflect typical process variations. For the material types and quantities on hand for each MBA and plant as described in 3.1.3 and 7.1, list the LE associated with the components of the ending inventory and the total LE for EI.

12.3 Material Unaccounted For (MUF)

It is anticipated that a complete material balance will not be achieved for an MBA or plant. The imbalance is MUF defined by the equation:

$$MUF = BI + A - EI - R$$

Describe the method used to accumulate the LE for the material balance and specify the typical LE associated with MUF (LEMUF). The calculation of LEMUF shall include both random and systematic errors. Care must be taken to consider all instances of co-variance (such as quantities based on common measurements, quantities in BI or A still on hand for EI, etc.) to preclude the incorporation of an identical LE more than once in the calculation of LEMUF. Similarly, care must be taken to include all sources of error in the accumulation of LEMUF.

12.4 Control System

Describe the control systems which will be utilized to monitor and control MUF and LEMUF performance on both a short and long term basis.

12.5 Relative LEMUF

If each typical plant LEMUF calculated in 12.3 exceeds the limitations outlined in 10CFR70.51(e)(5), identify the major contributors to the LEMUF. Describe the steps taken to reduce the LE associated with the major contributors, or to reduce their contribution. Outline the program designed to improve the LEMUF and the anticipated date when LEMUF will comply with the limitations in 10CFR70.51(e)(5).

13.0 SUPPLEMENTARY INFORMATION IN SUPPORT OF THE APPLICATION

The applicant may determine that the previous Chapters do not cover all aspects pertinent to his application. The applicant is encouraged to submit in this Chapter such additional information as he may believe helpful to a prompt evaluation and judgment of the adequacy of the application by the AEC Regulatory Staff.

CROSS REFERENCE OF STANDARD FORMAT
FOR MATERIAL CONTROL AND ACCOUNTING
TO 10CFR 70

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