



## MC&A PLANNING AND PERFORMANCE TESTING

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### Introduction

Material Control and Accounting (MC&A) regulations have been established as a combination of performance and compliance regulations. Performance based MC&A is based on regulatory standards and implemented in a site-specific approach. In addition to regulatory requirements for performance testing, guidance documents and training programs are available to assist facility personnel developing performance testing programs. A performance testing program is used to assure that the site-specific approach meets the intent of the performance standards. Performance tests may be limited in scope to address a single component of the MC&A system, or they may test the integrated effectiveness of several components or the system as a whole. Statistics of test results are maintained to provide quantitative measures of the MC&A system capabilities. An overview of performance testing as used at U.S. Department of Energy facilities will be provided.

### Regulations

The regulations in the United States specify performance tests be performed by both the sites and regulatory agencies. Sites conduct performance tests as part of the Internal Review and Assessments and also as part of specific Performance Testing programs. These tests serve to two functions: determining performance of the systems and establishing data that can be input into vulnerability analyses. Regulatory Agencies used performance tests to determine regulatory compliance, to assess the effectiveness of the MC&A program, and to assess the effectiveness of policies, procedures, systems, and operations. The elements of the regulatory program are: 1) review site performance testing program, 2) review regulatory oversight program, and 3) conduct tests.

### Key Issues

Performance tests are performed on specific aspects of the regulations or site policy. Some of the key issues in establishing a performance testing program are:

- Identifying what needs to be tested
- Determining how to test
- Establishing criteria to evaluate test results

A performance testing program may be limited in scope to address a single component of the MC&A system, or they may test the integrated effectiveness of several components or the system as a whole. Identifying the need should address regulatory requirements, the system design of the MC&A system, and any vulnerability analyses that have been conducted.

The program elements of a performance testing program consist of:

- Planning
- Coordination
- Conduct
- Evaluation

The planning phase needs to identify the elements to be tested and the type of testing for each of these elements. The planning process should all determine which tests are quantitative and which are qualitative. In addition the tests may be announced or unannounced. Based on the decisions about what is to be tested, schedules and procedures would be developed and submitted for review and approvals.

Before performance tests are conducted, they need to be coordinated to ensure that plant procedures are followed and that the integrity of the MC&A system is maintained. Performance tests should always be coordinated with appropriate personnel at the facility. Some performance tests require that personnel directly tested are unaware that a test is being conducted. Particular care is required to assure that these types of tests are coordinated and safely conducted. Preparatory notifications would be made within the MC&A organization as well as to other site organizations. The notifications need to identify how control will be maintained during tests and that the various organizations can distinguish between simulated situations and actual events. The coordination should establish the protocol for initiation and termination of the tests.

A performance test may be conducted of personnel or equipment. The purposes of equipment performance tests are to: validate that equipment is functional, to validate that the equipment has the proper sensitivity, and to determine whether the equipment will meet its design objectives. The purposes of performance tests of personnel are: to determine whether personnel know and follow procedures, to determine whether procedures are effective, to observe whether plans and procedures accurately describe operational conduct, and to determine whether personnel and equipment interact effectively. Conduct of the performance would include the following elements depending on the complexity of the test:

- Briefings
- Goals
- Methods
- Test Control and Constraints
- Conduct
- Participants
- Controllers and Observers
- Closeout
- Evaluation Criteria

Evaluation criteria need to be established before a performance test is conducted. Criteria may be quantitative or qualitative in nature. Quantitative tests, such as of a measurement system, can use the stated specifications for the system. Written tests or questionnaires can be evaluated

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by criteria established for the training program. For qualitative tests, such as observation of activities, evaluation criteria could include such items are

- Procedures were followed
- Correct result achieved
- Appropriate documentation was generated

MC&A exercises are performed to observe the operation of the system rather than just a component. Exercises are performed to determine that the system performs as described in site plans, and to determine that the system has the capability to meet the goals established by the site. Exercises may be limited in scope because of potential vulnerabilities or safety hazards. Some elements to be tested during an exercise are: command and control, defense-in-depth or redundancy of components, use of information resources, and interface to physical protection program.

### **Functional Areas and Example Performance Tests**

The DOE Orders for MC&A are divided into three functional areas: Program Administration, Material Accounting, and Material Control. Example Performance Tests may be conducted on Program Administration, Accounting, Measurement and Measurement Control, Inventory, and Containment.

Performance tests in the Program Administration topic address those elements to provide assurance that the MC&A system performs as intended. Tests could include:

- MC&A Training Effectiveness
- Written Tests
- Emergency Response
- Missing Items
- Hoaxes
- Physical Security Alarms

Performance tests of the Accounting topic may be similar to those performed as part of routine audits, or may address detection capability for falsified data. Some types of accounting tests are:

- Receipt Closure
- Data Traceability
- Document Accuracy
- Accounting System Failure
- Material Control Indicators

Measurements performance tests are very similar to the routine activities performed as part of the measurement control program. Example tests could include:

- Scales and Balances
- Nondestructive Assay
- Off-Specification Measurements
- Confirmatory Measurements

Inventory performance tests may be limited to a specific aspect of the inventory program or could be a full scope test. Examples for test of the inventory procedures could address:

- No-Notice Emergency Inventory
- Nuclear Material Locations
- Loss Detection Tests

## Computerization of NMC&A, Material Balance Evaluation, Reports Preparation

- Gross, Partial, and Bias Defects
- Statistical Sampling Plans

Example tests for the containment element could address the following topical areas of material control:

- Material Transfers
- Access Controls
- Portal Monitors
- Tamper-Indicating Devices
- Two-Person Rule
- Daily Administrative Checks

### **Summary**

Performance testing is a valuable tool for determining that the MC&A systems performs as intended. However, when conducting performance tests it is important that care is used to ensure that the integrity of the MC&A system is maintained. The key elements of a performance testing program are establishment of objectives, coordination of each test, and effective evaluation.