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DOE STANDARD

GUIDELINE TO GOOD PRACTICES FOR CONTROL AND CALIBRATION OF MEASURING AND TEST EQUIPMENT (M&TE) AT DOE NUCLEAR FACILITIES



U.S. Department of Energy
Washington, D.C. 20585

AREA MNTY

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FOREWORD

The purpose of the *Guideline to Good Practices for Control and Calibration of Measuring and Test Equipment (M&TE) at DOE Nuclear Facilities* is to provide contractor maintenance organizations with information that may be used for the development and implementation of a rigorously controlled maintenance program directed at controlling and calibrating M&TE used for maintenance tasks at DOE nuclear facilities. This document is intended to be an example guideline for the implementation of DOE Order 4330.4A, *Maintenance Management Program*, Chapter II, Element 11. DOE contractors should not feel obligated to adopt all parts of this guide. Rather, they should use the information contained herein as a guide for developing an M&TE program applicable to their facility.

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1. INTRODUCTION

1.1 Purpose

This guide is intended to assist facility maintenance operations in the review of existing and in developing new programs to ensure the accuracy and integrity of performance data derived from Plant process and control instrumentation is verified by controlled application of properly calibrated/certified measuring and test equipment (M&TE) having the appropriate precision, design accuracy, and durability for their intended use. It is expected that each DOE facility may use different approaches or methods than those defined in this guide. The specific guidelines that follow reflect generally accepted industry practices. Therefore, deviation from any particular guideline would not, in itself, indicate a problem. If substantive differences exist between the intent of the Guideline and actual practice, management should evaluate current practice to determine the need to include/exclude proposed features. A change to maintenance practice would be appropriate if a performance weakness was determined to exist. Development, documentation, and implementation of other features which further enhance these guidelines for specific applications, is encouraged. Additional information pertinent to the implementation of this guideline is found in the following DOE Guidelines:

- 1) *"Guidelines to Good Practices for Procurement of Parts, Materials, and Services at DOE Nuclear Facilities"*
- 2) *"Guidelines to Good Practices for Material Receipt, Inspection, Handling, Storage, Retrieval, and Issuance at DOE Nuclear Facilities"*

Appendix E is provided for use by facility trainers who intend to provide training regarding this element.

1.2 Background

The information in this guide was developed from commercial and DOE sources. Each facility should select those details that are applicable, add any unlisted knowledge or experience that are applicable, and develop and implement facility-specific M&TE maintenance programs. Facilities that have existing documented M&TE maintenance programs should review this guide to identify details that may enhance their existing programs.

1.3 Application

The content of this guide is generally applicable to all DOE nuclear facilities. Portions of the programs outlined may not be applicable to all facilities because maintenance organizations, disciplines, titles, and responsibilities may vary among DOE nuclear facilities. Facility maintenance personnel should verify the adequacy or improve existing maintenance programs by adapting this guide to their specific facility and individual maintenance disciplines.

2. DEFINITIONS

2. 1 Acronyms Used in this Standard. The acronyms used in this standard are defined as follows:
 - a. M&TE - Measuring and Test Equipment
 - b. NIST - National Institute of Standards and Technology
 - c. SSC - Structures, Systems, and Components
2. 2 Calibration. The comparison of readings from the instruments being tested with validated readings observed on the measurement standards.
2. 3 Certification. An indication by the appropriate authority that the deviations determined in the calibration do not exceed specified limits.
2. 4 Gross Error. An out-of-tolerance condition for an instrument in the M&TE Program which may result in an unacceptable product. When a plant guide has not been prepared or does not list gross error limits, any condition outside the calibration limits, defined by supervision in the group using the equipment, is considered a gross error.
2. 5 Measuring & Test Equipment. M&TE includes all devices or systems used to calibrate, certify, measure, gauge, troubleshoot, test, or inspect in order to control data or to acquire data to verify conformance to specified requirements. M&TE does not include permanently installed plant instrumentation, nor does it include test equipment used for preliminary checks where data obtained is not used to determine acceptability or verify conformance to established criteria.
2. 6 Primary Standards. Calibrated by the National Institute for Standards and Technology (NIST) or other authoritative reference source. Its use should be restricted to the standards laboratory.
2. 7 Recall Program. A system to recall and service measuring and test equipment (M&TE).
2. 8 Secondary Standards. Calibrated by comparison with a primary standard of the same measurement modes. It should be used by laboratory personnel and stored in the standards laboratory. Use by other than standards laboratory personnel should be limited to that approved by the applicable manager.

- 2.9 Standards Laboratory. A standards laboratory is a central on-site facility that maintains, calibrates, and certifies most of the plant portable instrumentation and test equipment.
- 2.10 Systems Stations. A location where two or more instruments are used as a unit to make certification measurements.
- 2.11 Working Standards. Calibrated in the plant with a primary or secondary standard of the same measurement mode, or calibrated using other measurement modes. It generally should be used in day-to-day activities, (mainly in direct field applications where direct/ready access is required or when ALARA considerations exist), to certify product certification equipment and instruments in the maintenance recall program using approved procedures.

3. CONTROL AND CALIBRATION OF MEASURING AND TEST EQUIPMENT (M&TE)

3.1 Discussion

The control and calibration of measuring and test equipment (M&TE) plays an ever increasing role in the safe operation of DOE Nuclear Facilities. The need to ensure proper calibration and traceability of use has increased. Therefore, implementation of an M&TE control and calibration program is essential. A computer based system should be considered for the establishment of an M&TE program.

This guideline establishes a process to ensure that M&TE is properly controlled, calibrated, and certified with standards and data traceable to NIST.

The M&TE program shall be comprehensive and ensure the following:

- 1) All M&TE is uniquely identified, calibrated, controlled, and provides accuracy traceability.
- 2) A recall program maintains the total inventory and status of all M&TE.
- 3) Out-of-tolerance M&TE is removed from service.
- 4) Plant equipment calibrated with out-of-tolerance M&TE is evaluated in a timely manner for impact on previous output, current operability and is re-calibrated as necessary.
- 5) The critical parameters of all M&TE such as range, precision, accuracy, etc. are documented; the documents shall be retrievable, and maintained as quality records.
- 6) Process repeatability.

M&TE intended only as an indicator during troubleshooting and not intended for calibration or data measurement should not be required to display calibration/certification identification.

The M&TE program should be regularly evaluated to:

- a) Detect trends which adversely affect safe, reliable use of equipment
- b) Determine opportunities for expanded applications of equipment

- c) Determine new technology and its potential for adding value to applications if acquired

3.2 Scope

This guideline applies to M&TE used on safety class items, as well as, safety-related structures, systems, and components (SSC) or on SSC which affects critical plant performance and reliability.

3.3 Responsibilities

3.3.1 M&O Operators

It is the responsibility of each M&O Operator to ensure that M&TE for their group has a current calibration sticker prior to use.

3.3.2 Plant Personnel

Plant personnel using M&TE should be responsible for reporting any malfunctions or suspected malfunctions to the cognizant department supervisor. Personnel should ensure that the equipment calibration date has not expired. Refer to Section 3.4.3.4.2 for appropriate action for equipment past the calibration due date.

3.4 Guidelines

3.4.1 Procurement and Acceptance of M&TE

3.4.1.1 Procurement

Copies of the technical manual with full schematics, troubleshooting sections, spare parts lists, table of specifications, and calibration procedures should be obtained with each type of equipment. A certificate of calibration and tolerance should be included. Distribution of these manuals shall be in accordance with document control procedures. Training aids furnished by the manufacturer(s) may be desirable for certain types of equipment, as determined by the M&TE requestor. Equipment selected should be the proper range, accuracy, and precision. Also, where practical, the equipment selected should be a type that minimizes the possibility of human error (e.g., direct digit readout, large mirror scale, null indicators, and direct temperature readout).

3.4.1.2 Receipt Inspection and Acceptance Test

Prior to acceptance, a receipt inspection and test should be conducted in accordance with DOE *"Guidelines to Good Practices for Procurement of Parts, Materials, and Services at DOE Nuclear Facilities," "Guidelines to Good Practices for Material Receipt, Inspection, Handling, Storage, Retrieval, and Issuance at DOE Nuclear Facilities"*) and applicable plant policies and procedures.

3.4.2 M&TE Identification

3.4.2.1 Each department should maintain a master inventory list of the applicable M&TE covered by this program. A standards laboratory should maintain a plant level master list of applicable M&TE. These listings should include the following information for each item:

- a) Systems/Stations number - this identifies a specific document which establishes parameters, range, precision, accuracy and other requirements for application of the individual item listed.
- b) Unique-Number
- c) Date of last calibration

- d) Expiration date
- e) Applicable procedure number
- f) Building/location
- g) Cost collection account
- h) Noun description
- i) Owner organization
- j) Calibration interval

3.4.2.2 For new equipment, the manager responsible for the equipment, should assign an appropriate identification number and establish a maintenance history file (see Section 3.4.6). The history file should be maintained by the standards laboratory.

3.4.2.3 Each item of M&TE should be marked with a unique identification number.

XXX	XXX
Group Identification	Unique Identification Number
IAC-Instruments and Control	
MNT-Maintenance	

Prefixes should be added to the unique identification number in order to group equipment by type (e.g., G-XXX for gauges or TW-XXX for torque wrenches). This designation should be etched into or permanently attached to the equipment in a manner that should not interfere with the operation or accuracy of the equipment. When this designation cannot be attached to the equipment, it shall be attached to the case with a means of identifying the equipment to the case (e.g., with color coding).

3.4.3 Control and Use of M&TE

3.4.3.1 Tagging

3.4.3.1.1 A "calibration" sticker shall be attached to each M&TE device. This sticker (see example Appendix A, Figure 1) should indicate: (1) date calibration performed (mo/day/year); (2) badge number of the individual who calibrated the device; and (3) expiration date (mo/day/year). The expiration date is determined from the interval and the date last calibrated. The calibration sticker should be removed and replaced with a new sticker each time the equipment is calibrated.

3.4.3.1.2 A "restricted use" sticker should be placed on any equipment requiring special restrictions or precautions in its use. This sticker (see example Appendix A, Figure 2) should be attached in addition to the calibration sticker and should include (1) equipment identification number, (2) a statement of the restrictions that apply, (3) badge number of the individual attaching the sticker, and expiration date, if applicable, and (4) the date the sticker is attached.

3.4.3.1.3 A "rejected" sticker should be placed on any equipment that fails to meet acceptance criteria or is suspected of being defective. This sticker (see example Appendix A, Figure 3) should include (1) device identification number, (2) reason for rejection, (3) badge number of the individual attaching the sticker. A "rejected" sticker may also be used to identify devices that are not to be used due to the device exceeding the calibration due date.

3.4.3.2 Storage

3.4.3.2.1 Department M&TE storage areas should be authorized by the maintenance manager. All equipment should be stored in a manner that assures integrity is maintained and unintended contamination is minimized. Equipment in these storage areas should be identified as to its current status, per Section 3.4.3.1 of this guideline. The M&TE storage areas should provide sufficient separation of the ready-to-use equipment (calibrated and restricted use) from other equipment (expired) to preclude inadvertent use.

3.4.3.2.2 The environment of M&TE storage areas should be controlled to preclude any adverse effect on equipment accuracy. Environmental factors that should be considered include, but are not limited to, temperature, humidity, vibration, radio frequency interference, electromagnetic interference, and fumes.

3.4.3.2.3 Security of the M&TE storage area should be maintained by designated individuals responsible for control of measuring and test equipment. In the absence of these individuals, the storage area should be locked with access controlled by the responsible department manager and/or supervisor.

3.4.3.2.4 Instruments used on systems that contain oil, brackish water, etc., should be cleaned thoroughly after each use.

3.4.3.3 Restrictions on M&TE Use

3.4.3.3.1 The use of equipment containing mercury should be prohibited on nuclear-related systems and should be restricted to absolute necessity on all other systems.

3.4.3.3.2 In applications where a caustic environment is present, the use of aluminum material in contact with the process liquid should be prohibited.

3.4.3.3.3 Oil-free stainless steel components (e.g., tubing, valves, Bourdon tubes, and pressure cells) should normally be used in nuclear applications.

3.4.3.3.4 Instruments used on systems that contain oil, brackish water, etc., should be identified clearly to avoid contamination of other systems. For example an oil-contaminated gauge should not be used on an oil-free compressed air system, or a saltwater gauge should not be used on a system containing process liquids.

3.4.3.4 Issue of M&TE for use

3.4.3.4.1 Issuing of M&TE should be conducted utilizing a usage record. (See Appendix B.) The M&TE should have a usage record filled out to identify each item calibrated or tested by that M&TE. A new usage record should be initiated each time the M&TE is calibrated, and the previous record should be retained in the maintenance history file. The usage record for each item of M&TE should be retained in the issue area.

3.4.3.4.2 Test equipment whose calibration has expired may be used only with written request from the operations manager and approval of the standards laboratory manager. If this situation occurs, the test equipment shall be calibrated as soon as feasible. If the calibration data reflect out-of-tolerance values, the maintenance performed with this test instrument shall be evaluated (see Section 3.4.5). M&TE with an expired calibration should be identified by a "rejected" sticker and placed in a location to satisfy Section 3.4.3.2.1 of this procedure.

3.4.3.5 Control

3.4.3.5.1 The control process used for M&TE should be a well established Recall Program containing, as a minimum the following controls:

- a) Total inventory listing
- b) Calibration DUE notices - weekly
- c) Individual automatic job opener and information cards
- d) Calibration OVERDUE notices - weekly

- e) Exception report for program errors
- f) Scheduled and nonscheduled action history reporting

3.4.3.5.2 Field use of other than "working" standards (i.e., primary/secondary) should be authorized only by the accountable supervisor and then only under controlled conditions and time limitations.

3.4.3.5.3 The application readiness of M&TE should be regularly verified by applicable testing; and where applicable, battery checks should be performed and pass/fail criteria for each item should be clearly indicated on each instrument. These readiness checks shall not be a substitute for calibration activities.

3.4.3.5.4 Special-, limited-, or restricted-use M&TE shall be clearly identified to describe its applicability.

3.4.3.6 Handling and Shipment of M&TE

During handling and shipment of M&TE devices M&TE integrity shall be maintained. Packaging for shipment to the standards laboratory should not conceal or destroy existing conditions of equipment. Packaging after calibration and certification should be in a manner which does not jeopardize equipment.

3.4.3.7 Traceability

M&TE shall be traceable from the field application, to the working standard, secondary standard, primary standard, and NIST or other nationally recognized standards. All calibration data should have both forward and reverse traceability between the specific item and the NIST.

3.4.4 Calibration of M&TE

3.4.4.1 M&TE should be calibrated using reference standards (secondary or working) whose calibration has a known valid relationship to nationally recognized standards or accepted values of natural physical constants. If national standards do not exist, the basis for calibration should be documented. The reference standard used should have an accuracy at least four times greater than the device under test. If this accuracy ratio cannot be met, analysis of the errors should be estimated to provide a valid uncertainty of the calibration process.

3.4.4.2 M&TE Calibration Schedule and Interval

The standards laboratory, in conjunction with each department manager responsible for M&TE, should establish and maintain a calibration schedule for the M&TE (including primary, secondary, and working standards. Specific items may be calibrated on a prior-to-use basis rather than on a periodic basis. These devices shall be controlled as specified in Sections 3.4.3.1 and 3.4.3.2 (tagging and storage).

The schedule should normally be divided by application departments. The M&TE assigned to a department should be listed in calibration due date order by the unique identification number of Section 3.4.2.3 and noun name. Calibration dates for similar M&TE should be staggered to ensure availability for day-to-day and peak needs. The established scheduling organization should normally update and distribute the schedule to the responsible department managers on a quarterly basis. Department managers should ensure that M&TE under their cognizance is calibrated in accordance with the master schedule.

The calibration intervals for M&TE should be established by the cognizant department managers. The initial interval should be based on the inherent stability characteristics of the device, the rate/level and purpose of expected use, manufacturer's recommendation, and historical data for similar equipment. Calibration intervals may be revised, based on a review of previous calibration results and maintenance history. Revision of calibration intervals should require the approval of the cognizant department manager. Revisions should be documented on the Calibration Interval Change Authorization form (Appendix C) which should be filed in the maintenance history.

3.4.4.3 Calibration of M&TE - On Site

All M&TE on-site calibration should be done using plant-approved procedures. These procedures should include the following items:

- identity of the equipment to be calibrated
- calibration equipment and reference standards to be used
- precautions and limitations
- checks, tests, measurements, acceptance tolerances, accuracy, precision, range, and specific parameters
- step-by-step instructions regarding sequence, methods, data sheet completion details, etc. (including as-found and as-left conditions)
- special instructions, such as environmental conditions, when appropriate
- reference standard used should have an accuracy at least four times greater than the device under test. If this accuracy ratio cannot be met, analysis of the errors should be estimated to provide a valid uncertainty of the calibration process.

M&TE calibration data sheets should include provisions for recording as-found data before any adjustments or repairs are made. Completed data sheets should be reviewed, by the standards laboratory supervisor, prior to release of the equipment to service to verify that acceptance criteria are satisfied. When M&TE is found to be out of calibration (gross error), an evaluation should be performed as described in Section 3.4.5. Completed data sheets should be filed with the maintenance history.

3.4.4.4 Calibration of M&TE - Off Site

M&TE may be calibrated by off-site organizations that have been approved in accordance with on-site quality assurance department procedures. Purchase orders or calibration requests to these organizations should reference or include the following information:

- tolerance requirements
- calibration test data requirements
- any special environmental, handling, and shipping requirements (see paragraph 3.4.3.6)
- calibration data to be supplied with the calibrated equipment

The off-site organization should also be required to provide immediate verbal notification if the as-found data for an M&TE device does not meet specified acceptance criteria. This notification is necessary to ensure that the evaluation required by Section 3.4.5 is initiated as soon as possible.

Upon return of the measuring and test equipment, the standards laboratory supervisor shall ensure that the calibration data submitted is reviewed, and an appropriate calibration sticker is attached.

3.4.5 M&TE Repairs/Out of Calibration

M&TE found to exceed required calibration tolerance or that has been subjected to possible damage should be identified as rejected. When repairs are required to standards or other measuring and test equipment they shall be re-calibrated to the original requirements prior to being returned to normal service. When calibration/certification is performed, the "as-found" condition and/or minor adjustments to the measuring and test equipment shall be noted as part of the equipment history information.

When M&TE is suspected or actually found to be inoperable, unreliable, defective, or out of calibration, all data recorded since the previous calibration by affected equipment shall be identified through the usage record described in Section 3.4.3.4.1 (see Appendix B). A prompt evaluation shall be performed to determine the need for corrective action. This evaluation shall be documented on a Gross Error Report (see Appendix D). The validity of all applications and data derived since the previous calibration should be evaluated and dispositioned by the appropriate owner/operator affected. The owner/operator of the affected equipment should establish the nature and timing of corrective actions.

3.4.6 Records

3.4.6.1 A maintenance history file should be kept for all M&TE. This file should include the following, as appropriate:

- manufacturer's data, including model number and serial number
- plant-unique identification number
- calibration interval and specifications
- history of calibrations, repairs, restrictions on use, and other appropriate data
- calibration non-conformance evaluations (Section 3.4.5)
- usage record (Section 3.4.3.4.1)
- non scheduled actions

3.4.6.2 Records for lost, destroyed, unavailable, or removed-from-use M&TE should be maintained in the history file.

3.4.6.3 Manufacturer's information manuals and supplemental bulletins should be filed in accordance with document control procedures.

APPENDIX A
EXAMPLE OF "STICKERS" (TAGS) USED
IN M&TE CALIBRATION PROGRAM

APPENDIX A

Example of "Stickers" (Tags) Used in M&TE Calibration Program

CALIBRATION	
Performed By: _____	Date: _____
Expiration Date: _____	

Figure 1
"Calibration Sticker"

I.D.No: _____	Date: _____
RESTRICTED USE	

By: _____	

Figure 2
"Restricted Use Sticker"

REJECTED	
I.D.No: _____	
Date _____	
Reason _____	

By _____	

Figure 3
"Rejected Sticker"

APPENDIX B
MEASURING AND TEST EQUIPMENT RECORD SHEET

APPENDIX C
CALIBRATION INTERVAL CHANGE AUTHORIZATION

APPENDIX C

CALIBRATION INTERVAL CHANGE AUTHORIZATION

Instrument Number: _____

Manufacturer: _____

Model Number: _____

Change Calibration Interval from _____

to _____

Reason:

Requested by: _____ Date: _____

Reviewed by: _____ Date: _____

Approved by: _____ Date: _____

APPENDIX D
GROSS ERROR REPORT

APPENDIX D

GROSS ERROR REPORT

FORM NO. _____

Plant

Facility Name

Instrument # _____

SR# _____

Manufacturer _____

Model # _____

Calibration Date _____

Previous Calibration Date _____

<u>Ranges Affected</u>	<u>% Error</u>	<u>Ranges Affected</u>	<u>% Error</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

This instrument was involved in activities associated with the attached list of equipment and/or jobs. Based on a review of the out-of-calibration condition and the affected list of equipment, the checked action is required.

_____ No Action Required:

_____ instrument was not used during period (no list)

_____ affected range(s) was not used

_____ the error did not cause any test result/calibration to exceed equipment allowable tolerances.

_____ instrument would not function and failure time and cause were known, providing reasonable assurance that the instrument was in calibration prior to failure

_____ other _____

APPENDIX D(Cont.)

GROSS ERROR REPORT

_____ Based on the Evaluation:

_____ The equipment listed on the attached "retest" list requires retest/rework. _____ has been issued to ensure completion of the required action

_____ The equipment listed on the list was retested/reworked, and no further action is required.

_____ Other _____

Remarks _____

Review made by: _____
Name

Date: _____

Approved by: _____
Cognizant Supervisor

Date: _____

APPENDIX E
CONTROL AND CALIBRATION OF MEASURING
AND TEST EQUIPMENT (M&TE)
SAMPLE LESSON PLAN

APPENDIX E
CONTROL AND CALIBRATION OF MEASURING AND TEST EQUIPMENT (M&TE)
SAMPLE LESSON PLAN

LESSON PLAN

1. The instructor should be familiar with the following background information:
 - a. Measuring and Test Equipment (M&TE) includes instruments, tools, and devices used to calibrate or verify installed field equipment. Typically M&TE equipment comes in two forms, primary and secondary standards. A primary standard is traceable to the National Institute of Standards and Technology (NIST) and is environmentally controlled at the owner facility. The secondary standard is traceable to the primary and is used for field calibration of installed equipment.
 - b. An effective M&TE program should contain the following elements:
 - M&TE program based on traceable standards,
 - controlled procedures used to calibrate M&TE,
 - facilities established for control, storage, and issuance of M&TE,
 - unique identification number for each piece of M&TE,
 - any M&TE found out of calibration tolerance (gross error) receives a timely evaluation to determine the condition of all the calibrations for which it was used since its last successful calibration, and
 - periodic reviews to determine that the control of M&TE is effective.
2. To teach this lesson, the following training housekeeping items are required:
 - a. Location for the training,
 - b. Approximately 30 minute time period for the training,
 - c. Notification of selected employees, and
 - d. A copy of the facility's M&TE program.

APPENDIX E (Cont.)

3. This lesson has the following trainee enabling objective:

Explain the purpose and function of an M&TE program.
4. M&TE includes instruments, tools, and devices used to calibrate or verify installed field equipment. Typically, M&TE equipment is defined as a primary or secondary standard. A primary standard is traceable to NIST and is environmentally controlled at the owner facility. A secondary standard is calibrated to the primary and used for field calibration of installed equipment. Additional discussions on M&TE include the following:
 - a. All calibrations of M&TE should be traceable to NIST. The primary standard is traceable to NIST, the secondary to the primary, and field equipment to the secondary. The use of primary standards for field use should be discouraged.
 - b. Calibration procedures should be used for all primary to secondary calibrations. Only qualified technicians should perform these calibrations. The interval of calibrations should be determined based on the manufacturer's recommendations, the M&TE usage, and the M&TE's historical reliability.
 - c. Primary and secondary standards should be stored in an environmentally controlled area. Issuance of M&TE should be controlled to prevent M&TE damage due to wrong application, misuse of the M&TE by unqualified workers, and field calibrations with out-of-tolerance M&TE.
 - d. A master list of all controlled M&TE should be maintained to include the following:
 - description of the equipment,
 - discrete identification number,
 - calibration procedures and periodic interval of calibration, and
 - ranges of calibration and required accuracy.
5. Discuss with the trainees the facility's M&TE program.

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CONCLUDING MATERIAL

Review Activities:

<u>DOE</u>	<u>Field Offices</u>
AD	AL
DP	CH
EH	ID
EM	NV
ER	OR
NP	RL
NS	SR
RW	SF

Preparing Activity:

DOE-NE-73

Project Number:

MNTY-0015

Area Offices

Amarillo
Brookhaven
Kansas City
Kirtland
Princeton

Facilities

ANL
BNL
LBL
PNL
PPPL
SNL
NV REEC_o.
NV EG&G
OR OSTI
WHC
EG&G
RF
SLAC
WSRC

United States Department of Energy
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