



# BOSTON Edison COMPANY

NUCLEAR OPERATIONS DEPARTMENT  
 PILGRIM NUCLEAR POWER STATION  
 Procedure No. 1.3.36  
 MEASUREMENT AND TEST EQUIPMENT

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## I. PURPOSE

To establish a procedure for ensuring that measuring and test equipment (M&TE) are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within prescribed limits.

## II. DISCUSSION

This procedure applies to measuring and test equipment used on safety-related systems and components or on systems that affect plant performance, reliability and systems which the Vice President - Nuclear have agreed to exercise QA program management controls.

M&TE includes the devices or systems used to calibrate, 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 will not be used to determine acceptability or verify conformance to established criteria.

## III. REFERENCES

- A. IEEE-Standard 498-1975; Standard Requirements for the Calibration and Control of Measuring and Test Equipment Used in the Construction and Maintenance of Nuclear Power Generating Statics.
- B. ANSI N18.7 - 1976; Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.
- C. Boston Edison Quality Assurance Manual Volume II.
- D. INPO Goal Practice, MA-303 (May, 1982) Control and Calibration of Measuring and Test Equipment (M&TE).
- E. NOP 8303 (6/30/83) Calibration Program.

## IV. PROCEDURE

### A. Responsibility

#### 1. I&C Engineer

The I&C Engineer is responsible for maintaining the Master Measurement and Test Equipment List.

#### 2. Chief Engineers/Group Leaders

The cognizant Group Leader designated on the list is responsible to develop a Group List which identifies the measuring and test equipment controlled by the Group which requires calibration, the calibration interval, appropriate calibration procedure number, scheduled calibration date and actual calibration date.

## 3. Supervisors

- a) It is the responsibility of each Group Supervisor to assure that the method, as designated by the Cognizant Chief Engineer/ Group Leader, for documenting Measurement and Test Equipment usage is satisfactorily completed and properly maintained.
- b) It is the responsibility of each Group Supervisor to assure that the Measurement and Test Equipment assigned to his group is properly calibrated and to provide a method or means for said calibration.

## 4. Plant Personnel

- a) Plant personnel using Measuring and Test Equipment shall be responsible for reporting any malfunctions or suspected malfunctions to the cognizant supervisor or his designee.
- b) Personnel using Measuring and Test Equipment shall ensure that the equipment is not past the calibration due date, as indicated on the affixed calibration sticker, while in use. Personnel shall also ensure that equipment is not used outside of its scope of limitations.
- c) Personnel using Measuring and Test Equipment shall provide the cognizant supervisor with the necessary information, in a manner prescribed by the Owner Group's established guidelines, to properly update the usage of Traveler Sheets.

B. Procurement

Copies of the Technical Manual complete with full schematics, troubleshooting sections, spare parts lists, table of specifications, and calibration procedure should be obtained with each different piece 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 manufacturer(s) may be desirable for certain types of equipment as determined by the requesting sections. Where practical, equipment selected should be of a type that minimizes the possibility of human error, e.g., direct digit readout, large mirror scale, null indicators, and direct temperature readings.

C. Identification

- 1. Each group shall maintain a list of applicable Measurement and Test Equipment covered by this procedure. The I&C Engineer will maintain the Master Measurement and Test Equipment List (MM&TEL). (see G.2.3.C.)
- 2. For new equipment, the Cognizant Chief Engineer/Group Leader assigns an appropriate number (see IV.C.3) and establishes and maintains an equipment history file.

3. Each item of Measurement and Test Equipment shall be marked with a unique identification number. This number shall contain three (3) sections:

NOTE

Tool Management has incorporated a multi-digit alpha-numeric system that is readily recognized (Attachment A) and will continue utilizing that system.

- a) The prefix will identify the owner's group. The following prefixes are assigned:

|   |   |                        |
|---|---|------------------------|
| C | - | Computer Group         |
| E | - | Electric lab           |
| H | - | Health Physics         |
| I | - | Instrument and Control |
| M | - | Maintenance            |
| N | - | N.E.D. (C.M.G.)        |
| O | - | Operations             |
| Q | - | Q.A./Q.C.              |
| W | - | Water Chemistry        |

- b) The body of the number should be referenced to the device, i.e., range, model number, serial number, etc.
- c) The suffix of the number, if required, should be an alpha character. Sequential letters should be assigned to identify similar or identical devices assigned to a group.

These guidelines apply to any devices added to or replaced in the MM&TEL after the acceptance date of this procedure and should not be construed as a requirement for each group to renumber its existing inventory. The Cognizant Chief Engineer/Group Leader will determine if a renumbering effort is required.

This designation should be etched into, or permanently attached to the equipment in a manner that will not interfere with the operation or accuracy of the equipment. When this designation cannot be put on the equipment, it shall be put on the case with a means of identifying the equipment to the case. (Attachment B)

D. Control and Use

1. Tagging

- a) Calibration Status - A "calibration" sticker is attached to each M&TE device. This sticker, (Attachment C Figure 1), should indicate: (1) calibration date (month/day/year); (2) initials of the individual who calibrated the device, and (3) calibration due date (month/day/year). The calibration due date is the specified frequency from the date last calibrated. The calibration sticker is removed and replaced with a new sticker each time the equipment is calibrated.
- b) Limited Use - A "Limited Use" sticker will be placed on any equipment requiring special restrictions or precautions in its use. This sticker (Attachment C Figure 2) is attached in addition to the calibration sticker, and should include: (1) equipment identification number, (2) initials of the individuals attaching the sticker, and (3) the date the sticker is attached. Scope of limitations will be identified on the calibration sheet.
- c) Rejected - A "Rejected" sticker is placed on any equipment that fails to meet acceptance criteria or is suspected of being defective. This sticker (Attachment C Figure 3) should include: (1) device identification number, (2) reason for rejection, (3) initials of the individual attaching the sticker, and (4) the date the sticker is attached. 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.

2. Storage

- a) Location - The cognizant Chief Engineer/Group Leader shall provide space for storing the M&TE assigned to his group. The equipment in this storage area shall be identified as to its current status per Section IV.D.1. of this procedure. The M&TE storage area shall provide sufficient separation of the ready-to-use equipment (Calibrated and Limited Use) from other equipment (Rejected) as to preclude inadvertent use.
- b) Environment - The environment of M&TE storage area should be controlled as necessary to preclude any adverse effect on equipment accuracy. Environmental factors that shall be considered include, but shall not be limited to, temperature, electromagnetic interference, and fumes. When inaccuracy of measuring and test equipment, or reference standards, because of environmental effects, cannot be avoided, compensating corrections shall be determined and applied.

- c) Security - When not in use, Measurement and Test Equipment shall be maintained in a locked/secure enclosure such that unauthorized use is prohibited. This is to ensure proper use and documentation of devices/procedures, etc. tested by the M&TE.

3. Restrictions on M&TE Use

- a) The use of equipment containing mercury is prohibited on nuclear-related systems and should be restricted to absolute minimum necessity on other systems.
- b) In applications where boron is present, the use of aluminum material in contact with the process is prohibited. Stainless steel components (e.g., tubing, valves, bourdon tubes, and pressure cells), free from oil should be used in nuclear applications.

4. Issuance of Measuring and Test Equipment for Use

- a) Issuance of M&TE shall be conducted in such a manner as to provide a method of identifying and documenting each item calibrated by that M&TE. Ideally, the issuance of M&TE should be conducted utilizing a Traveler Form (Attachment D). A new Traveler should be initiated each time the M&TE is calibrated with the previous Traveler being retained in the Equipment History file. The cognizant Chief Engineer/Group Leader will establish the best method for his Group.
- b) M&TE may be issued to individuals who are not plant employees. Each Chief Engineer/Group Leader shall approve and maintain a list of non BECo organizations that are authorized to check out plant M&TE devices.

5. Handling and Shipment of M&TE

Handling and shipment of M&TE devices shall be in a manner that is in accordance with, or more conservative than, the applicable manufacturer's recommendations.

6. Personnel

It is the responsibility of each group leader to ensure that his/her personnel are adequately trained and that only authorized personnel use M&TE.

E. Calibration of M&TE

1. M&TE shall be calibrated using reference standards whose calibration has a known valid relationship to nationally recognized standards or accepted values of natural physical constants. If no national standards exist, the basis for calibration shall be documented. The reference standard used should have an accuracy four times greater than the device under test. If this accuracy

ratio cannot be met, a detailed analysis of the errors should be estimated providing a valid uncertainty of the calibration process.

2. Calibration Schedule and Frequency

- a) The Standards Laboratory, in conjunction with each Chief Engineer/Group Leaders responsible for M&TE, shall establish and maintain a calibration schedule for the M&TE. Specific items may be calibrated on a prior-to-use basis rather than on a periodic basis. These devices must be controlled as specified in Sections IV.D.1 and IV.D.2 (Tagging and Storage).
- b) The calibration frequencies for M&TE should be established by the Chief Engineer/Group Leaders. The initial interval should be based on the inherent stability characteristics of the device, the frequency 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 equipment history. Revision of calibration intervals shall require the approval of the cognizant Chief Engineer/Group Leader. Revisions shall be documented on the Calibration Frequency Change Authorization form (Attachment E), which will be filed in the equipment history and calibration shall be performed if new due date is more restrictive.

3. Calibration of M&TE - On Site

- a) The M&TE on-site calibration will be done using plant approved procedures. These procedures shall include, as a minimum, the following:
  - (1) Identity of the equipment to be calibrated
  - (2) Calibration equipment and reference standards to be used
  - (3) Checks, tests, measurements, and acceptance tolerances
  - (4) Sequence of operations
  - (5) Special instructions, such as environmental conditions, when appropriate
- b) The M&TE calibration data sheets will include provisions for recording "as-found" data before any adjustments or repairs are made. Completed data sheets shall be reviewed by the Standards laboratory supervisor and filed with the equipment history. When M&TE is found to be out of calibration, an evaluation shall be performed as described in Section IV.F (M&TE Out of Calibration).
- c) 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.

F. M&TE Out of Calibration1. M&TE Out of Calibration - Correctable

M&TE found to exceed required calibration tolerance or that has been subjected to possible damage shall be identified as rejected. An evaluation shall be promptly initiated and documented (Attachment F). The equipment tested or calibrated using the M&TE since its last calibration shall be identified through the usage record described in Section IV.D.4 (Issued or M&TE for Use). The validity of these calibrations and tests shall be determined and, if necessary, the tests shall be repeated using properly calibrated equipment.

2. M&TE Out of Calibration - Noncorrectable

- a) An evaluation shall be promptly initiated and documented as specified in Section IV.F.1.
- b) The M&TE that is Noncorrectable shall be retired from the Master Measurement and Test Equipment List, and the appropriate Group List. It will have the identification number and the calibration tags removed.
- c) The device should be destroyed; however, if the out-of-tolerance error is deemed minimal by the cognizant Chief Engineer/Group Leader, the device may be used for troubleshooting or general non-calibration use.
- d) The identification number of retired M&TE will not be used to identify another piece of M&TE for two (2) years from the date of retirement. This will prevent any confusion regarding tracking evaluations.

G. Records1. Master Measurement and Test Equipment List (MM&TEL)

- a) The MM&TEL will be maintained by the I&C Engineer.
- b) The MM&TEL will be a compilation of both (see Attachments G and H) individual group lists maintained by each Group.

2. Group Lists

- a) Each Group will maintain two (2) separate lists.
  - 1) "Numerical Instrument Number List": (Attachment G)

This is a list, sorted by instrument number only, of all Measurement and Test Equipment maintained by the Subject Group. The order of the sort will be alpha/numeric, digit by digit, left digit to right digit,



ignoring dots, dashes etc. If an alpha character is used in place of a numeric character, it will be sorted alphabetically preceding any numeric characters in that position. An example of how instrument Numbers 1A, 1, 20A, A200, 200 and 1000 would be listed:

A200  
1  
1A  
1000  
20A  
200

This list is maintained at the front of the section for each Group and allows for retrieval of specific information concerning a device by identifying the section in which the device is contained ( T) - Temperature. (E) - Electrical, (M) - Mechanical, (P) - Pressure. Ten (10) out-of-order entries are allowed. More than ten (10) requires the list to be corrected inserting all out-of-order entries.

2) "Measurement and Test Equipment List": (Attachment H)

These pages will be filed Alpha Numerically within a category (identified by the circled numbers). The categories will be filed numerically by the adjacent circled numbers. Similar instruments, I.E. Categories 1 - 6 contain identical information, are listed on the same sheet. If the information contained in any of the six (6) categories are different, another sheet is required.

The establishment of these two (2) lists will allow for easy cross reference between the assigned Instrument Number, Manufacturer, Model No., parameter and/or range. This provides the information necessary for the addition of new equipment, assigning sequential instrument numbers, with virtually no possibility of duplicate numbers and a method of tracking retired numbers for the two (2) year inactive period required before re-issuance.

2. Group Lists

3) Equipment History File

- a) Each piece of M&TE will have an Equipment History File.
- b) The Equipment History File will be maintained by the Owner Group.
- c) The Equipment History File shall include as appropriate:

- (1) Manufacturer's data, including model number and serial number
- (2) Plant-unique identification number
- (3) Calibration frequency and specifications
- (4) History of calibrations, repairs, restrictions on use, and other appropriate data
- (5) Calibration nonconformance evaluations (Section IV.F.)
- (6) Usage record (Section IV.D.4)
- (7) Calibration procedure number

V. ATTACHMENTS

- A. Tool Management Numbering System
- B. Controlled Instrument Tag
- C. Figure 1 - "Calibration" Sticker  
Figure 2 - "Limited Use" Sticker  
Figure 3 - "Rejected" Sticker
- D. Traveler Form
- E. Calibration Frequency Change Form
- F. Tracking Sheet Form
- G. Numerical Instrument Number List Form
- H. Measurement and Test Equipment List Form



ATTACHMENT B

PILGRIM 1  
CONTROLLED INSTRUMENT  
NO.





ATTACHMENT E  
CALIBRATION FREQUENCY CHANGE AUTHORIZATION

Instrument Numer \_\_\_\_\_

Manufacturer \_\_\_\_\_

Model Number \_\_\_\_\_

Change Calibration Frequency from \_\_\_\_\_

to \_\_\_\_\_

next calibration date \_\_\_\_\_

Calibration stickers due date revised \_\_\_\_\_  
(initials)

Reason:

Requested by \_\_\_\_\_ Date \_\_\_\_\_

Reviewed by \_\_\_\_\_ Date \_\_\_\_\_

Approved by \_\_\_\_\_ Date \_\_\_\_\_  
(Chief Engineer/Group Leader)

ATTACHMENT F

PILGRIM NUCLEAR POWER STATION

TITLE: OUT OF CALIBRATION REPORT

|                        |                                 |
|------------------------|---------------------------------|
| INSTRUMENT# _____      | SR NO# _____                    |
| 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 because:
  - 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 could not have been used (would not function) and before calibration data, after repair, was within specified limits.
  - Instrument would not function and failure time and cause was known, providing reasonable assurance that the instrument was in calibration prior to failure.
  - Other \_\_\_\_\_

- Based on the Evaluation
  - The equipment listed on the attached "retest" list requires to be retested/reworked and the items not having a completed date must be retested/reworked \_\_\_\_\_ 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 \_\_\_\_\_





