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Project Operation
Civil Works Test, Measurement, and Diagnostic Equipment

FOR THE COMMANDER:

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Chief of Staff

Purpose. This engineer circular provides requirements and guidance for calibration of test, measurement, and diagnostic equipment used by U.S. Army Corps of Engineers Civil Works and establishes guidance for communication of test, measurement, and diagnostic equipment status.

Applicability. This engineer circular is applicable to all U.S. Army Corps of Engineers major subordinate commands managing Civil Works test, measurement, and diagnostic equipment.

Distribution Statement. Approved for public release; distribution is unlimited.

Proponent and Exception Authority. The proponent of this circular is Operations Directorate, U.S. Army Corps of Engineers Civil Works. The proponent has the authority to approve exceptions or waivers to this circular that are consistent with controlling law and regulations. Only the proponent of a publication or form may modify it by officially revising or rescinding it.

*This circular supersedes EC 1110-2-6077 dated 21 March 2025.

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SUMMARY of CHANGE

EC 1110-2-6077

Civil Works Test, Measurement, and Diagnostic Equipment

This revision, dated 3 April 2025:

- Paragraph 10 b. (6) revised to correct appendix from Appendix A to Appendix B.
- Removed “A” at the end of Appendix B-5 paragraph.

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Glossary of Terms

1. Purpose

This engineer circular provides requirements and guidance for calibration of test, measurement, and diagnostic equipment used by U.S. Army Corps of Engineers Civil Works and establishes guidance for communication of test, measurement, and diagnostic equipment status.

2. Distribution statement

Approved for public release; distribution is unlimited.

3. References

See Appendix A.

4. Records management (recordkeeping) requirements

The records management requirement for all record numbers, associated forms, and reports required by this publication are addressed in the Army Records Retention Schedule. Detailed information for all related record numbers is located on the U.S. Army Corps of Engineers (USACE) Records Management Site <https://usace.dps.mil/sites/INTRA-CIOG6/SitePages/Records-Management.aspx>. If any record numbers, forms, and reports are not current, addressed, and/or published correctly, see DA Pam 25-403 for guidance.

5. Associated publications

This section contains no entries.

6. Risk-informed decision making approach to calibration intervals and requirements

a. Director's Policy Memorandum provides the USACE risk-informed decision making (RIDM) model process which establishes a disciplined process by which risks, and uncertainties are identified, assessed, communicated, and managed to accomplish specified objectives.

b. The level of detail and formality associated with each step of the RIDM model will be influenced by factors such as available resources, decision complexity, and impact to project outcomes.

c. Test, measurement, and diagnostic equipment (TMDE) Owners should consider the following when considering inherent risks:

- (1) What can go wrong?
- (2) How can it happen?
- (3) What are the consequences of the risk if it occurs?
- (4) What is the likelihood the risk will occur?

d. Risk management options should be formulated for all risks that are deemed unacceptable. Following development of risk management options, a risk treatment plan should be implemented to mitigate risk to an acceptable level.

e. Where risk management options do not reduce the identified risk to tolerable levels, the TMDE owner should adjust calibration requirements accordingly.

7. Calibration Requirements

Calibration of TMDE is used to reduce out of tolerance risk. Calibration of TMDE that has regulatory, environmental, or safety requirements will be current before use. Otherwise, TMDE calibration requirements will be established by the TMDE Owner using a risk-informed approach considering industry best practice and facility intended use. TMDE that is not calibrated per manufacturer's recommendation or industry best practice must be calibrated before use for critically designated purposes. TMDE will not be used for a critically designated purpose if calibration is expired.

a. Calibrated TMDE is required when low out of tolerance risk is needed for any of the following critically designated purposes:

- (1) Certification or calibration of other equipment.
- (2) Precision measurements.
- (3) Performance testing.
- (4) Protection equipment testing.
- (5) Life safety assessments.
- (6) Condition assessment or trending.
- (7) In-house calibrations.

b. TMDE that does not support a critically designated purpose relies on the discretion of the TMDE Owner to ensure a risk-informed approach is employed when determining calibration needs.

8. Determination of Calibration Requirements

a. TMDE Owners will implement the RIDM process when considering the calibration requirements of TMDE.

b. The TMDE Owner is responsible for determining calibration requirements for TMDE when that requirement deviates from the manufacturer's recommendations.

c. In all cases, where TMDE is to be used for a critically designated purpose, the tool must have a valid certificate of calibration before use.

d. The TMDE Owner should determine the calibration interval barring any industry, safety, regulatory, or customer requirements. Additionally, risk management options must be in place for all identified intolerable risks. Risk management options that result in a tolerable level of risk may be considered as viable risk treatment options.

e. The TMDE Owner should consider the TMDEs intended use and the impacts, or consequences when determining calibration interval that does not conform to manufacturer's recommendations. Additionally, TMDE Owners should consider the TMDE's function, usage level, manufacturer's recommended measurement tolerance, calibration interval, environmental range of use and storage, direct and indirect costs of calibration, and the likelihood of out-of-tolerance calibration and its consequences if not calibrated.

f. TMDE Owners should use the RIDM process to set the calibration interval for each TMDE and to facilitate calibration prioritization. The following represents the potential outcomes of a risk-informed approach to determination of calibration requirements:

Table 1
Determination of Calibration Requirements

Critical function?	Calibration Interval
Y	Certified calibration as required by manufacturer or certified calibration occurring at TMDE Owner's discretionary interval; calibration required before use, as applicable.
Y/N	Uncertified in-house calibration before use at TMDE Owner's discretion where certified calibration is unnecessary or not feasible.
N	Calibration not required. TMDE is not critical. Basic functional test good practice.

9. Tracking of Test, Measurement, and Diagnostic Equipment

At a minimum, TMDE Owners will maintain an inventory of all TMDE to be used for critically designated purposes, as well as the resulting maintenance schedule for necessary calibrations. The inventory should include:

- a. TMDE Description.
- b. Unique Identifier (i.e., serial number (if applicable)).
- c. Manufacturer.
- d. Model.
- e. Bar Code (if applicable).
- f. Calibration Frequency.
- g. Date of last calibration

- h.* Calibration Due Date.
- i.* Calibration status.
- j.* Condition.
- k.* Reference for calibration requirement.
- l.* TMDE Owner's determination of risk management protocol and suggested calibration interval frequency.
- m.* TMDE Owner's name and signature.

10. Roles and Responsibilities

a. District Responsibility

- (1) Review mission requirements and identify which TMDE is necessary.
- (2) Ensure TMDE calibration requirements are identified and tracked. Ensure calibrated TMDE is used when addressing critically designated purposes in accordance with this policy.
- (3) Ensure critical TMDE is identified to attain 100% accountability and the ability to track calibration requirements.

b. TMDE Owners – responsibilities can be designated, however the TMDE Owner is responsible to ensure compliance of the following:

- (1) Identify critical TMDE to attain 100% accountability and track calibration requirements.
- (2) Serves as the central point of contact for matters concerning TMDE calibration and repair to include appropriate storage, tracking, and scheduling of TMDE.
- (3) Ensures reports for tracking scheduling and delinquencies of TMDE calibration are available.
- (4) Responsible to manage out-of-tolerance risks associated with TMDE where project personnel safety or critical systems are affected.
- (5) Responsible to manage out-of-tolerance risks associated with TMDE to protect the equipment being serviced and ensure the quality of maintenance work performed where TMDE is used.
- (6) TMDE must be tracked in accordance with District Policy. The inventory will be kept up to date with all facility owned TMDE that must be tracked according to this Engineer Circular (EC). Facility-level Operations will use the Facility and Equipment Maintenance (FEM) system for recording the required information. See Appendix B to

this EC for information on using the FEM system to align with the requirements of this EC.

(7) Ensures an updated copy of the commercial calibration certificate is on file for all TMDE that are being calibrated by the manufacturer, vendor, company, or lab.

c. Maintenance Personnel

(1) Responsible to manage out-of-tolerance risks associated with TMDE to protect the equipment being serviced.

(2) Ensure the quality of maintenance work performed where TMDE is used.

Appendix A

References

Section I

Required Publications

ISO/IEC 17025

General requirements for the competence of testing and calibration laboratories: 2017
(Available at <https://www.iso.org/standard/66912.html>)

Section II

Prescribed Forms

This section contains no entries.

Appendix B

Test, Measurement, and Diagnostic Equipment Guidance

B–1. Overview

The objective of this appendix is to provide a consistent enterprise process for managing and recording facility-level TMDE inventory. All TMDE used for critically designated purposes owned at the facility level have requirements for calibration and management; and tracking those requirements is essential to facility personnel and equipment safety. The FEM system is the USACE Civil Works computerized maintenance management system of record, and this appendix describes how facility managers throughout the enterprise will use FEM to execute their TMDE tracking and scheduling responsibilities.

B–2. Responsibilities

- a. TMDE Owners are required to identify critically measured systems at their facilities.
- b. TMDE Owners throughout the enterprise have a responsibility to identify, manage, and track calibration and repair of TMDE necessary for critically measured systems. TMDE Owners will use a risk-based approach when assigning calibration intervals that are contrary to the manufacturer's recommendations. Calibration intervals must be documented in FEM along with basic information regarding the TMDE.
- c. The TMDE Owner has the ultimate responsibility to determine the calibration interval of TMDE.
- d. The TMDE Owner will maintain a workflow process providing direction for carrying out that TMDE responsibility, which includes but is not limited to:
 - (1) The identification of TMDE used for critically designated purposes.
 - (2) Appropriate scheduling of calibration for TMDE.
 - (3) Identification of work that requires appropriately calibrated TMDE.
 - (4) Ensuring TMDE is marked with appropriate calibration identification where required.
 - (5) Communicating this information in FEM.
- e. USACE recognizes and accepts that differences in staffing and organizational structure among Districts and operating projects/facilities may require that TMDE Owners combine or divide duties when assigning to staff the roles and responsibilities associated with work and database management. However, the ultimate responsibility remains with the TMDE Owner and may not be delegated.

B-3. Procedure – Test, Measurement, and Diagnostic Equipment Asset Records

Asset records will be created for all TMDE used for critically designated purposes according to this policy. The following procedure does not entirely address the information required to develop an Asset record per existing guidance and instruction. However, it does address the information necessary to effectively manage and accurately communicate the TMDE of focus within this EC. Additionally, this procedure addresses certain processes and standards regarding data quality. Asset record information for TMDE must be entered and complete as outlined in this procedure.

a. TMDE identification. TMDE will be identified by creating an asset record in FEM. In addition to standard information required for an asset record in FEM (i.e., asset number, organization code, parent asset, etc.), the following data will be filled in on the FEM asset record for all TMDE.

(1) *Asset description*. Asset description consists of the nomenclature, class, and the identifier 'TMDE' (i.e., safety equipment, environmental monitoring, hazardous gas detection monitors – TMDE). The identifier of 'TMDE' will indicate that the asset should be reviewed for calibration purposes.

(2) *Parent asset*. Identify the TMDE parent asset. TMDE may be recorded under one parent asset.

(3) *Bar code*. If TMDE has been barcoded, the applicable bar code should be entered.

(4) *National stock number (NSN)*. Serial number, model name/number: Information found on the TMDE regarding NSN (if available), serial number and model name and number will be recorded on the asset record.

(5) *Asset Criticality*. Where TMDE has an intended use for a critical function, the asset criticality should be determined critical (i.e., greater than 5).

(6) *Manufacturer*. Enter the manufacturer of the asset.

(7) *Classification and associated attributes*. The classification of 'TMDE' will be associated to the asset. These attributes include:

(a) The last calibration date.

(b) Calibration interval (calibration not required, administrative, annual, etc.).

b. Recommended FEM Asset record fields. The following information is recommended on the FEM Asset record:

(1) *Purchase price*. Enter the original purchase price of the asset. This information will assist managers in understanding if the direct and indirect cost of calibration are warranted.

- (2) *Installation Date.* Enter the date the TMDE was originally put into service.
- (3) *Year Manufactured.* Enter the date the TMDE was manufactured.
- (4) *Service Life (Yrs.).* Enter the expected service life of the asset in years. This information assists in determining depreciation value of the asset.
- (5) *Other Asset information.* Any information the TMDE Owner deems relevant.

B-4. Procedure

Facility managers should review the FEM TMDE report quarterly for any TMDE assets required for work orders that need calibration prior to the maintenance activity. Facility managers should identify the critically measured systems that require calibrated TMDE for pending preventive or corrective maintenance. Adding a task to the job plans involving critically measured systems in FEM stating "requires calibrated TMDE" can help the manager ensure TMDE calibration/maintenance intervals support the maintenance activities of the critically measured systems.

B-5. Records

A TMDE asset data report will be available in FEM at a local, regional, and national level for use in assessing the implementation of this policy.

Glossary of Terms

<u>Term</u>	<u>Definition</u>
FEM	Facility and Equipment Maintenance
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NSN	National Stock Number
RIDM	Risk-Informed Decision Making for Program
TMDE	Test, Measurement, and Diagnostic Equipment

Critically Designated Measurements

Any function requiring accuracy and precision, preservation of life and safety, and environmental preservation

Measured System

System(s) or assets the TMDE is intended to measure.

Test, Measurement, and Diagnostic Equipment (TMDE)

Any system or device used to evaluate the operational condition of an end-item or subsystem thereof to identify and isolate any actual or potential malfunction. This TMDE includes diagnostic and prognostic equipment; semiautomatic and automatic test equipment, to include test program sets (with issued software); and calibration test or measurement equipment.

International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 17025 refers to this equipment as “measuring and test equipment”. Commercial laboratories providing calibration services must adhere to ISO/IEC 17025.

TMDE Owner

Facility managers or program managers who can make the determination of whether the TMDE is required to be calibrated to deliver the program. TMDE owners are responsible for managing the equipment and have knowledge of the TMDE use, need to avoid added risk to the program delivery.