

AD719203

4 December 1968

Materiel Test Procedure 10-2-191
General Equipment Test Activity

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

BUOYS, MOORING

1. OBJECTIVE

This document sets forth the test methods and techniques for determining the technical performance and safety characteristics of mooring buoys and their associated tension bars as described in Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), Military and/or Technical Characteristics (MC's or TC's), and to determine the item's suitability for service tests.

2. BACKGROUND

Whenever anchorage area is limited and/or a system of maximum anchoring berths per anchorage area is required, mooring buoys are the most effective means of accomplishing the task. Through the anchoring procedures for the mooring buoys themselves the swing radius, and thus the swing area, is greatly reduced for craft at anchor or moored. (See Figure 1)

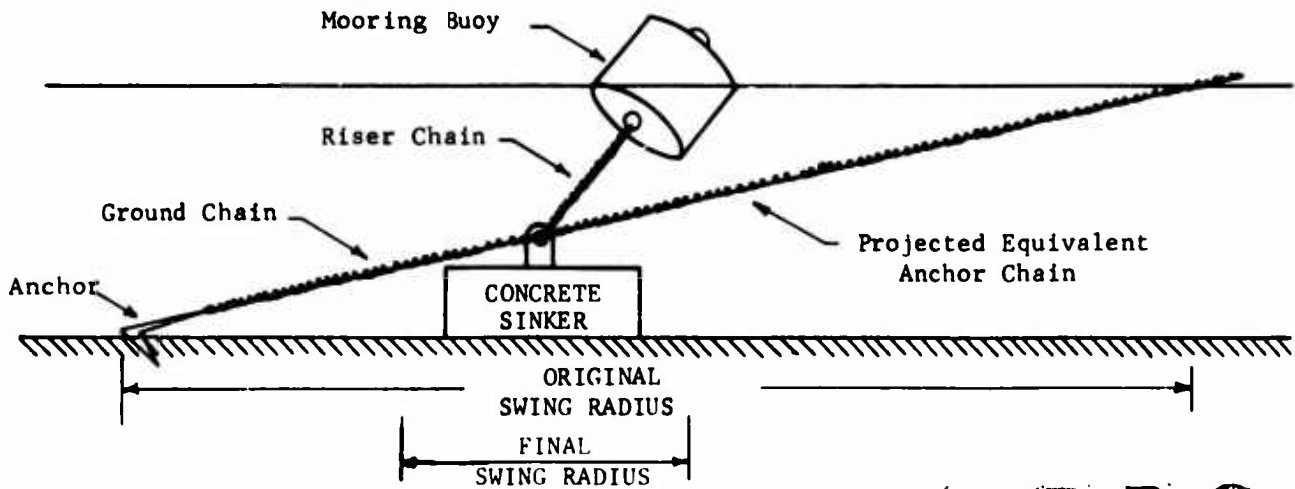


Figure 1. Swing Radii Comparison

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Because of the intended use of mooring buoys Engineering Tests should be undertaken to ensure compliance with fittings requirements as well as buoyancy requirements. Ideally, buoys, once installed, require little or no maintenance over long periods of time and, thus, some consideration of the buoys durability and strength of seams is necessary.

3. REQUIRED EQUIPMENT

- a. Scales.
- b. Steel Tape.
- c. Pressure Gauge.
- d. Air Compressor.
- e. Soapsuds Solution.
- f. Paint thickness measuring device.
- g. Paint Composition Tester.
- h. Ultrasonic Flaw Detector.
- i. Tensile Strength Tester.
- j. Test Tank capable of simulating waves and water conditions up to sea state 5.
- k. Camera and film.
- l. Stopwatch

4. REFERENCES

- A. Military Specification MIL-3-16115D, Buoys, Mooring and Marker.
- B. Military Specification MIL-T-704, Treatment and Painting of Material.
- C. Military Standard MIL-STD-129, Marking for Shipment and Storage.
- D. Military Standard MIL-STD-209B, Slings Eyes and Attachments for Lifting and Tying Down Heavy Military Equipment.
- E. Military Standard MIL-STD-810B, Environmental Test Methods.
- F. USATECOM Regulation 385-6, Safety Release.
- G. USATECOM Regulation 700-1, Value Engineering.
- H. USATECOM Regulation 705-4, Equipment Performance Report.
- I. Technical Manual TM 5-360, Port Construction and Rehabilitation.
- J. MTP 10-2-500, Physical Characteristics.
- K. MTP 10-2-501, Operator Training and Familiarization.
- L. MTP 10-2-502, Durability.
- M. MTP 10-2-503, Transportability.

5. SCOPE

5.1 SUMMARY

This MTP includes the following:

- a. Operator Training and Familiarization.
- b. Receipt Inspection - An inspection of the test item to determine its arrival condition and whether any damage was incurred during transport.
- c. Physical Characteristics.
- d. Leakage Test - A study to determine the test item's water sealing characteristics to ensure its function as a flotation device.

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- e. **Transportability Test** - A study to determine the test item's ability to withstand the shock it may encounter in handling and transporting conditions.
- f. **Durability** - A study to determine the anti-corrosive, anti-fouling and buoyance characteristics of the test item and to determine the tensile strength of the associated tension bar.
- g. **Safety** - A determination of the safety features of the test item and its associated package.
- h. **Value Analysis** - A determination of unnecessary features of the test item.

5.2 LIMITATIONS

These procedures relate to mooring buoys of the anchored flotation device type only. No consideration of anchoring procedures or equipment is contained.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Operator Training and Familiarization

a. Ensure the availability of personnel who have been oriented with the operation and handling of the test item using the criteria of MTP 10-2-501 and the applicable technical manuals stressing instruction in the following areas:

- 1) Leakage evaluation
- 2) Transportability evaluation
- 3) Durability evaluation
- 4) Safety precautions
- 5) Value analysis

b. Record the following for each member of the test team:

- 1) For civilian personnel:
 - a) Rating
 - b) Job title
 - c) Job description
- 2) For military personnel:
 - a) Rank
 - b) MOS
 - c) Training time in MOS
 - d) Experience in MOS

6.1.2 Receipt Inspection

Upon receipt, subject the test item to pre-test inspection as described in the applicable sections of MTP 10-2-500 and the following:

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a. Visually check test item blocking, bracing, and tie-downs and record:

- 1) Evidence of damage or deterioration
- 2) Identification marking including:
 - a) Manufacturer
 - b) Number and date of contract
 - c) Date of manufacture
 - d) Type and size of buoy as per MIL-B-16115D
 - e) Weight

b. Visually inspect the test item and record the following, when applicable:

- 1) Evidence of defects in:
 - a) Manufacturing
 - b) Material
 - c) Workmanship

NOTE: 1. Visual inspection shall concentrate on the following:

- a. Painted Surfaces, Seams, and Fittings. Shall be free from roughness and irregularities.
- b. Castings. Shall be free from patching, misplaced coring, warping, or other defects which render the castings unsound for use.
- c. Forgings. Shall be uniform in quality and condition, and shall be free from tears, cracks, laps, ruptures, imbedded scale, segregations, or other defects which would detrimentally affect the suitability for the purpose intended.
- d. Rubber Fenders. Shall be uniform in appearance and workmanship, and shall be free from porous areas, bubbles, foreign matter, and other detrimental defects and irregularities.
- e. Wood Bearing and Rubbing Strips. Shall be neatly and accurately cut, contoured, finished and drilled, and shall fit snugly to the buoy.

2. Any roughness or irregularities described could be a source for corrosion and/or fouling, and should be recorded.

- 2) Evidence of damage and/or wear.
- 3) Existence of shortages in test package.

c. Photograph any damage observed.

d. Inspect the test item and ensure markings are as per MIL-STD-129 and record any discrepancies.

e. Record presence, location and type of instruction plates (weld bead, monel plate), if applicable, including:

- 1) Identification: Name and Serial number
- 2) Caution instructions
- 3) Service and handling instructions

f. Inspect all painted surfaces and record the following:

- 1) Color code used
- 2) Type paints used (anti-corrosion, anti-marine, etc.) and locations
- 3) Evidence of:
 - a) Peeling
 - b) Blistering
 - c) Cracking

g. Determine and record the maximum distance at which any lights, reflectors, and/or reflecting paint can be seen during daylight and night conditions.

h. Determine and record the paint thickness, interior and exterior, if applicable.

i. Ensure paint composition complies with anti-corrosive and anti-fouling characteristics as specified in the applicable QMR's, SDR's, or other developmental criteria.

6.1.2.1 Flaw Detection Test

a. Test each buoy for internal flaws in the metal with an ultrasonic flaw detector and thickness gauge.

NOTE: Emphasis shall be put on welded seams, castings, and forgings.

b. Record the type and location of any flaws.

6.1.3 Physical Characteristics

Determine the physical characteristics of the test item as described in the applicable sections of MTP 10-2-500 and record the following:

- a. Overall weight
- b. Overall diameter
- c. Overall height
- d. Cubage
- e. The presence of all fittings and components, including:
 - 1) Tension bar w/chain connections
 - 2) Manholes w/covers
 - 3) Mooring eyes
 - 4) Chafing rails
 - 5) Reflectors, lights, etc.

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f. Dimensions of tiedown and lifting attachments.

NOTE: Tiedown and lifting attachments shall be provided and shall withstand the forces as appropriate and will be in accordance with MIL-STD-209B.

6.2 TEST CONDUCT

NOTE: All equipment failure during the test procedures shall be reported in accordance with USATECOM Regulation 705-4.

6.2.1 Leakage Test

NOTE: This leakage test shall be performed on all compartmented buoys except rubber, or foam-filled types.

6.2.1.1 Preparation

- a. Consult all applicable safety manuals for special handling precautions.
- b. Tightly secure any manholes, latches, etc.
- c. Prepare a solution of soapsuds and glycerine as described in the test plan.

6.2.1.2 Procedure

- a. Pressurize each compartment to a minimum of 10 psi not to exceed 15 psi, or as directed in the test plan, for a minimum of 30 minutes.
- b. Apply the prepared soapsuds solution over the external surfaces of the pressurized buoy.
- c. Observe and record any bubbling produced as a result of leakage.
- d. Record the following:
 - 1) Pressure
 - 2) Leakage, if any, and location, such as on a weld, manhole, etc.
 - 3) Time from beginning of test leakage was observed

6.2.2 Transportability Test

- a. Determine the transportability of the test item as described in the applicable sections of MTP 10-2-503.
- b. At the completion of each transportability test of step a, subject the test item to the leakage test of paragraph 6.2.1.

6.2.3 Durability

Determine the durability of the test item as described in the applicable sections of MTP 10-2-502 and the following:

6.2.3.1 Salt Fog Test

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Determine the resistance of the test item to the effects of a salt atmosphere using the criteria of MIL-STD-810B, Method 509 and the following:

a. Record evidence of any of the following upon completion of test:

- 1) Corrosion and location
- 2) Cracking, peeling, or checking of paint and location

b. Inspect light domes, reflectors and/or areas painted with reflecting paint for salt fouling, as applicable. Determine and record the maximum distance at which the light, reflectors and/or reflecting paints can be seen under conditions of daylight and night.

6.2.3.2 Buoyancy Test

6.2.3.2.1 Preparation - Perform the following:

a. Secure all hatches, latches, etc., as applicable, and rig the buoy for on-station mooring.

b. Install the test item in the test tank using only the on-station moorings.

6.2.3.2.2 Procedure - Perform the following:

a. Subject the test item to the following simulated sea states ("olkman) for a minimum of six hours or as stipulated in the test directive:

- 1) Sea state 1
- 2) Sea state 3
- 3) Sea state 5 (for heavy duty buoys only)

b. During the test, observe and record any capsizing or negative buoyancy observed and the sea state condition at which it was observed.

c. Record whether the buoy meets the minimum visibility access (hull above water) requirements as follows:

- 1) A minimum of 90% of the time for visibility at sea state 1
- 2) A minimum of 75% of the time for visibility at sea state 3
- 3) A minimum of 75% of the time for visibility at sea state 5, as applicable

d. At the completion of the test, inspect the test item, exterior and interior, as applicable, and record the following:

- 1) Evidence of leakage and location
- 2) Effects of chain-beating on:
 - a) Paint
 - b) Welds
 - c) Castings
 - d) Reflectors, etc.

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6.2.3.3 Tension Test

Determine and record the tensile breaking strength of the test item's tension bar using a tensile strength tester.

6.2.4 Safety

NOTE: Test personnel shall comply with USATECOM Regulation 385-6 and all safety regulations governing the operation of all test equipment.

Record the following throughout testing:

- a. Dangerous or unsafe conditions resulting from inadequate features, such as inadequate handling devices.
- b. Safety features of the buoy, such as safety post.
- c. Suggestions to improve existing safety precautions.

6.2.5 Value Analysis

- a. Throughout the test, examine the test item for any unnecessary features as described in USATECOM Regulation 700-1.
- b. Record features which could be eliminated without compromising performance, reliability, durability, or safety.
- c. Question test personnel for features of the test item that may be eliminated without decreasing the functional value of the test item.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Operator Training and Familiarization

a. Record the following:

1) For all civilian personnel:

- a) Rating
- b) Job title
- c) Job description

2) For military personnel:

- a) Rank
- b) MOS
- c) Training time in MOS, in months
- d) Experience in MOS, in months

6.3.1.2 Receipt Inspection

Record data collected as described in the applicable sections of MTP 10-2-500 and the following:

a. For test item blocking, bracing, and tiedowns:

- 1) Evidence of damage or deterioration
- 2) Identification marking including:
 - a) Manufacturer
 - b) Number and date of contract
 - c) Date of manufacture
 - d) Type and size of buoy
 - e) Weight, in pounds

b. For the test item:

- 1) Evidence of defects in:
 - a) Manufacturing
 - b) Material
 - c) Workmanship
- 2) Evidence of damage and/or wear
- 3) Shortages in the test package
- 4) Discrepancies in test item markings
- 5) Presence, location, and type of instruction plates including:
 - a) Identification
 - b) Caution instructions
 - c) Service and handling instructions
- 6) Painted surfaces:
 - a) Color code used.
 - b) Type paints used (anti-corrosion, anti-marine, etc.) and location.
 - c) Evidence of:
 - (1) Peeling
 - (2) Blistering
 - (3) Cracking

c. The maximum distance, in yards, at which any lights, reflectors, and/or reflecting paint can be seen:

- 1) Daylight
- 2) Night

d. Paint thickness, in inches:

- 1) Interior

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2) Exterior

- e. Any discrepancies in paint composition
- f. Retain all photographs.

6.3.1.2.1 Flaw Detection Test -

Record any flaws detected:

- a. Type
- b. Location

6.3.1.3 Physical Characteristics

Record the physical characteristics of the test item, determined as described in the applicable sections of MTP 10-2-500 and/or the following:

- a. Overall weight, in pounds
- b. Overall diameter, in feet
- c. Overall height, in feet
- d. Cubage, in ft³
- e. Presence of fittings and components, including:
 - 1) Tension bar w/chain connections
 - 2) Manholes w/covers
 - 3) Mooring eyes
 - 4) Chafing rails
 - 5) Reflector, lights, etc.
- f. Dimensions of tiedown and lifting attachments, in inches.

6.3.2 Test Conduct

6.3.2.1 Leakage Test

Record the following:

- a. Pressure used in test, in psi
- b. Any leakage observed:
 - 1) Location
 - 2) Time, from beginning of test

6.3.2.2 Transportability Test

a. Record data collected as described in the applicable sections of MTP 10-2-503.

b. Record data collected as described in paragraph 6.2.1.

6.3.2.3 Durability and Reliability

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6.3.2.3.1 Salt Fog Test -

Record the resistance of the test item to the effects of a salt atmosphere using the criteria of MIL-STD-810B, Method 509 and the following:

- a. Evidence of the following:
 - 1) Corrosion:
 - a) Location
 - 2) Cracking, peeling, or checking of paint:
 - a) Location
- b. Evidence of salt fouled light domes, reflectors, and/or reflecting paint.
- c. Maximum distance, in yards, at which the light, reflectors, and/or reflecting paints can be seen under the following conditions:
 - 1) Daylight
 - 2) Night

6.3.2.3.2 Buoyancy Test -

- a. Record the following during the tests:
 - 1) Any capsizing or negative buoyancy observed:
 - a) Sea state
 - 2) Whether the test item meets the minimum visibility requirements as specified.
- b. Record the following at completion of the test:
 - 1) Evidence of leakage:
 - a) Location
 - 2) Effects of chain-beating on:
 - a) Paint
 - b) Welds
 - c) Castings
 - d) Reflectors, etc.

6.3.2.3.3 Tension Test -

Record the tensile breaking strength of the test item's tension bar, in pounds.

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6.3.2.4 Safety

Record the following:

- a. Dangerous or unsafe conditions resulting from inadequate features
- b. Safety features of the buoy
- c. Suggestions to improve existing safety precautions

6.3.2.5 Value Analysis

Record the following throughout the test:

- a. Nonfunctional or unnecessary features
- b. Test personnel's comments

6.4 DATA REDUCTION AND PRESENTATION

Data obtained during the conduct of the test will be summarized, making use of photographs and charts, as appropriate. Test data will be obtained for each buoy tested, and summarized and evaluated as required.

Data obtained for each performance characteristic will be compared with established technical performance characteristics as per MIL-B-16115D. Test data obtained from different types of buoys undergoing the same test will be compared.

In addition to charts and photographs, presentation shall include narrative reports on all phases of the test.

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