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Materiel Test Procedure 10-4-016
U. S. Army Arctic Test Center

U. S. ARMY TEST AND EVALUATION COMMAND
ENVIRONMENTAL TEST PROCEDURE

ARCTIC ENVIRONMENTAL TEST OF PETROLEUM HANDLING EQUIPMENT
(MOBILE POL STORAGE AND TRANSPORT EQUIPMENT)

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1. OBJECTIVE

The objective of this MTP is to provide information for evaluating the performance, safety, human factors engineering, maintainability and reliability aspects of Petroleum Handling Equipment in Arctic winter conditions.

2. BACKGROUND

Valid comparison of different designs of petroleum handling equipment are necessary to insure selection of the most suitable equipment in a natural arctic winter environment.

Testing in a natural arctic winter environment is used to substantiate or provide guidance to all USATECOM agencies concerned with the preparation of test directives, plans, reports and with the conduct of tests. Environmental arctic testing is generally not authorized until data from simulated environmental tests provides reasonable assurance that the test item will function satisfactorily when subjected to the conditions that would be encountered in the arctic.

3. REQUIRED EQUIPMENT

- a. Appropriate arctic winter uniforms.
- b. Containers for sampling and draw-off.
- c. Flowmeters.
- d. General and special tools, and ancillary items required for repairs or maintenance on the test item.
- e. Meteorological support facility.
- f. Petroleum - oil - lubricants.
- g. Photographic equipment (black and white or color).
- h. Platform scales.
- i. Pressure gage.
- j. Pump, return.
- k. Thermocouples.
- l. Vehicles (cargo).
- m. Control items (when specified).

4. REFERENCES

- A. AR 70-8, Human Factors and Social Sciences Research.
- B. AR 70-10, Test and Evaluation During Research and Development of Materiel.
- C. AR 70-38, Research, Development, Test and Evaluation of Materiel for Extreme Climatic Conditions.

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MISSION	D. AR 705-5, <u>Army Research and Development.</u>
STI	E. AR 705-6, <u>Maintenance Support Planning.</u>
IS	F. USATECOM Regulation 350-6, <u>Training in New or Modified Equipment and Training Devices.</u>
NA/NO/HC/O	G. USATECOM Regulation 385-6, <u>Verification of Safety of Materiel During Testing.</u>
IS	H. USATECOM Regulation 705-2, <u>Documenting, Test Plans and Reports.</u>
AVAILABILITY CODES	I. MIL-F-8901B, <u>Filter/Separators, Aviation and Motor Fuel, Ground and Shipboard Use, General Requirements and Test Procedures For.</u>
REL. AND SPECIAL	J. MTP 9-2-298, <u>Fuel Monitoring and Purity Devices.</u>
	K. MTP 10-4-500, <u>Arctic Environmental Test, Preoperational Inspection, Physical Characteristics, Human Factors, Safety and Maintenance Evaluation.</u>

5. SCOPE

5.1 SUMMARY

The procedures outlined in this MTP are designed to determine and evaluate the performance and characteristics of skid tankers and mobile Petroleum-Oil-Lubricants (POL) storage devices (e.g., sliding and rolling storage reservoirs), in arctic winter environmental conditions.

The specific tests to be performed and their intended objectives are listed below:

- a. Preoperational Inspection and Physical Characteristics - The objective of this subtest is to determine if the test equipment is in proper condition for testing and to determine the physical characteristics of the equipment.
- b. Stowage Test - The objective of this subtest is to determine the stowage provisions for all equipment required to be carried on or in the test item.
- c. Transportability - The objective of this subtest is to determine if the test item and its accessories can be handled and transported under arctic winter environmental conditions.
- d. Installation - The objective of this subtest is to determine the ease of installing the test items and components under arctic winter environmental conditions.
- e. Functional and Operational Suitability - The objective of this subtest is to determine the suitability of petroleum handling equipment when subjected to arctic winter environmental conditions.
- f. Human Factors and Evaluation and Safety - The objective of this subtest is to determine if all accessories and components of the test items enable easy operation by test personnel wearing the appropriate arctic uniform.
- g. Maintenance Evaluation - The objective of this subtest is to determine if the test items meet maintenance and reliability requirements as defined by Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), or other established criteria under arctic environmental conditions.

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*attends ANSTE-TS Aberdeen
Proving Ground, Md, 21005*

5.2 LIMITATIONS

The procedures described in this MTP are limited to general testing only of POL handling equipment. Specific procedures and testing requirements will be determined by the characteristics and performance criteria of the test item.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Since arctic winter environmental tests are normally scheduled from October through March (6 months), ensure that the test and comparison items are delivered to the Arctic Test Center prior to 1 October.

b. TDY personnel shall be used to augment assigned personnel and shall be trained to the degree that they are as proficient on the individual test and comparison items as the troops who will use these items.

c. Ensure that all test personnel are familiar with the required physical, technical and operational characteristics of the item under test, such as stipulated in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR) and Technical Characteristics (TC), and record this criteria in the test plan.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of test item, and familiarize all test personnel with available references.

e. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET).

f. Record the following information:

- 1) Nomenclature, serial number(s), and manufacturer's name of the test items.
- 2) Nomenclature, serial number(s), accuracy tolerances, calibration requirements, and last date calibrated of the test equipment selected for the tests.
- 3) Date test items were packed.

g. Select test equipment ideally having an accuracy 10 times greater than that of the specified tolerance of the function to be measured.

h. Prepare record forms for systematic entry of data, chronology of tests, and analysis in final evaluation.

i. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test. Ensure that a Safety Release has been obtained prior to test conduct.

j. Outfit all test personnel in appropriate arctic winter clothing as described in MTP 10-4-500, and with individual field equipment, during all equipment testing.

k. Ensure that when not in use, all test and comparison test items are stored and maintained in an unsheltered area and exposed to ambient air tempera-

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ture and prevailing weather conditions.

1. Record the prevailing meteorological conditions during the test conduct, to include:

- 1) Temperature
- 2) Humidity, relative or absolute
- 3) Temperature gradient
- 4) Atmospheric pressure
- 5) Precipitation
- 6) Wind speed and direction
- 7) Frequency of readings
- 8) Source of data

m. Upon notice of the arrival of the test item(s) or the estimated time of arrival, select and schedule the use of testing sites, facilities and equipment as required by the applicable subtest and/or the corresponding MTP, if required.

6.2 TEST CONDUCT

- NOTE:
1. The following subtests may be conducted concurrently with other MTP's of similar items of equipment, if within the arctic winter environment.
 2. Review all safety precautions regarding the operation of equipment carrying combustible products.

6.2.1 Preoperational Inspection and Physical Characteristics

Upon receipt, carefully inspect all test items and their shipping and/or packaging containers for completeness, damage and general conditions in accordance with applicable sections of MTP 10-4-500.

6.2.2 Stowage

- a. Stow the equipment on or in the test item in accordance with instructions contained in the appropriate technical manual.
- b. Note the adequacy of stowage space, brackets, and containers.
- c. Record the following data:
 - 1) Adequacy of stowage space
 - 2) Adequacy of brackets and containers

6.2.3 Transportability

- a. Inspect the test item and its accessories prior to loading.
- b. Load on or connect to the prime mover vehicle in accordance with applicable equipment instructions.
- c. Transport the test item with a full load over established secondary roads and cross-country courses containing straight level stretches, curves and grades.

NOTE: The operator shall maintain maximum speed consistent with road conditions and condition of courses.

d. Determine the following:

- 1) The capabilities of the prime mover to ascend and descend snow covered longitudinal and side slopes in either direction.
- 2) The capabilities of the test item-prime mover combination to ascend and descend snow covered longitudinal and side slopes in either direction.
- 3) The brake holding ability on the maximum longitudinal slopes that the prime mover can ascend, for both the parking and service brakes with the vehicle headed first up, then down the slope.
- 4) The brake holding ability on the maximum longitudinal slopes that the test item-prime mover can ascend, for both the parking and service brakes with the vehicle headed first up, then down the slope.

e. Throughout the conduct of the test the test item shall be inspected hourly and at the conclusion of the test for possible damage resulting from transport.

f. Record the following data:

- 1) Type or prime mover used.
- 2) Maximum safe speed at which the test item can be transported.
- 3) Time required for the prime mover to negotiate secondary roads and cross-country courses with and without the test item.
- 4) Maximum snow depth negotiated with and without the test item.
- 5) Gradient of longitudinal and side slopes negotiated by prime mover with and without the test item.
- 6) Emergency stop distances with and without the test item.
- 7) Turning radii with and without the test item.
- 8) Evaluation of the ability of the test item-prime mover to maintain its position in convoys.
- 9) Observe the effects of the test item on the stability, acceleration, braking, and steering of the prime mover.
- 10) Payload transported.
- 11) Ambient air temperatures.
- 12) Results of inspection.
- 13) Damage which resulted from transport.

g. Repeat steps a through f above, transporting the test item with one half its rated load.

NOTE: Transportability tests should be performed in the arctic only when the data obtained does not duplicate information already available on the prime mover, or information attained at other testing facilities.

6.2.4 Installation

6.2.4.1 Skid POL Tankers

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a. Install the test item in accordance with the instructions contained in the technical manual.

NOTE: Installation shall be accomplished during the temperature range specified in the test criteria.

b. Record the following data:

- 1) Ambient air temperatures and wind velocities.
- 2) Type, quantity of special equipment, and special skills required, if any, for installation.
- 3) Number of men and time required to assemble and install test item.
- 4) Any difficulties encountered.
- 5) Photographs of the installation.

6.2.5 Functional Suitability

NOTE: Following initial installation, if any, the test item shall be operated in accordance with instructions in the technical manual.

a. Subject the test item to drain-fill cycles as specified in the test criteria. The test item shall be filled to capacity a minimum of one cycle, half-capacity one cycle and 3/4 capacity for two cycles.

NOTE: The test item shall be operated with standard military fuels.

b. During filling and draw-off operations, periodically interrupt the pumping and vary the flow rate in order to determine the effects of flow fluctuation on the test item.

c. Operate the test item at lower temperature limits for as long a time as feasible consistent with the availability of low ambient temperatures and adequate manpower.

d. Use the storage device pump to fill and discharge the fuel compartments. The suitability of the pump and the time required to perform this operation will be recorded and evaluated.

e. Discharge the fuel in the compartments into fuel tanks of tracked and wheeled vehicles and petroleum storage facilities using the pump and gravity discharge methods.

f. Record the following data:

- 1) Ambient air temperature.
- 2) Total gallons of each type of fuel pumped and stored.
- 3) Filling and dispensing procedures utilized.
- 4) Types of fuel tanks filled from storage device.
- 5) Adequacy of operational controls, hoses and nozzles.
- 6) Total hours of operation.
- 7) Incompatibility of hoses, couplings, pumps or attachments.
- 8) Any leakage or spillage to include location and amounts.

- 9) The capacity of the test item, amount of product that cannot be withdrawn, and flow rate during drain-fill operations using a flowmeter.
- 10) The rate at which the test item can be filled and emptied.

6.2.6 Human Factors Evaluation and Safety

a. Conduct all Human Factors and Safety Tests in accordance with applicable sections of MTP 10-4-500 and include the following:

- 1) Adequacy of marking and indicators.
- 2) Adequacy of handles, levers, fasteners, connectors and other items requiring manual operation.
- 3) Operations which are time consuming and inconvenient.

b. Conduct these tests concurrently with the operational tests (installation, transportability and functional suitability as described in this MTP).

6.2.7 Maintenance Evaluation

- a. Conduct all Maintenance Evaluation Tests (maintainability, durability, and reliability) in accordance with applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests.

6.3 TEST DATA

All test data to be recorded shall be as specified in the individual subtests of his MTP.

6.4 DATA REDUCTION AND PRESENTATION

Processing of raw test data shall, in general, consist of organizing, marking for identification and correlation, and grouping the test data according to test title.

Specific instructions for the reduction and presentation of individual test data are outlined in the succeeding paragraphs.

6.4.1 Preoperational Inspection and Physical Characteristics

Preoperational inspection and physical characteristics data shall be reduced and presented in accordance with MTP 10-4-500.

6.4.2 Stowage

Evaluate the adequacy of stowage space, brackets and containers.

6.4.3 Transportability

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The suitability of the test item to be transported under arctic winter environmental conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to the test items attributed to transporting shall be compared with test item specifications contained in appropriate QMR, SDR, and TC.

6.4.4 Installation

The suitability of the test items for installation under arctic winter environmental conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to the test items attributed to installation shall be compared with test item specifications contained in appropriate QMR, SDR and TC.

6.4.5 Functional and Operational Suitability

The functional and operational suitability data shall be compared against accepted military standards.

6.4.6 Human Factors Evaluation and Safety

Human factors engineering and safety will be reduced and presented in accordance with MTP 10-4-500.

6.4.7 Maintenance Evaluation

Maintenance data shall be reduced and presented in accordance with MTP 10-4-500.

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