

25 August 1969

Materiel Test Procedure 9-2-211
General Equipment Test Activity

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

SANDERS, BELT OR DISK

1. OBJECTIVE*

This document provides test methods and techniques necessary to determine the technical performance and safety characteristics of belt or disk sanders and associated tools and equipment, as described in Qualitative Material Requirements (QMR's), Small Development Requirements (SDR's), and Technical Characteristics (TC's) and to determine the item's suitability for service testing.

2. BACKGROUND

The Army has requirements for machines and devices which will be used in general shop operations. These devices are used to either aid in or provide for the operations which are performed on raw materials or parts in order to modify them in some manner. The sander is a typical device of this class. Through the action of high speed abrasive surfaces, the sander provides for such operations as finishing, mitering, deburring and chamfering on wood, metal and plastic materials.

The basic design of most modern shop equipment, including the sander, is similar. A motor supplied with external electrical power provides at its rotating shaft certain energy/load characteristics. This energy is coupled by mechanical linkage giving the working tool or surface a desired motion and power which in turn provides for the required operation on the work piece.

The purpose of testing the sander will be to determine that it satisfies not only the general requirements of all military equipment and specific requirements of its device class but that it accomplishes its primary functional purpose through effective utilization of the design principles listed above.

3. REQUIRED EQUIPMENT

- a. Electromagnetic Interference (EMI) Testing Facility - Shielded Room or Open Area.
- b. Maintenance Facilities.
- c. Sound Anechoic Chamber.
- d. Ohmmeter.
- e. 500 V.D.C. Megohmmeter or Bridge.
- f. Dielectric Strength Tester 0-3000VRMS, 25-60 HZ.
- g. Wheatstone Bridge.
- h. Vibration Measuring Set.
- i. Electronic Counter and Tachometer Generator.
- j. Electromagnetic Interference (EMI) Instruments and Antennas per MIL-STD-461.

*This MTP is intended to be used as a basic guide in preparing actual test plans for the subject equipment. Specific criteria and test procedures must be determined only after careful appraisal of pertinent QMR's, SDR's, MC's, TC's and any other applicable documents.

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- k. Thermometers Liquid in glass °C.
- l. Sound Level Meter per ASA S1.4-1961.
- m. Octave Band Noise Analyzer per ASA S1.6 - 1960.
- n. Wattmeter.
- o. Rulers and Scales.
- p. Miscellaneous Hand Tools.
- q. Straight Edges.
- r. Feeler Gauges.
- s. Lubricants and Lubricating Equipment.
- t. Sample Material Blocks.
- u. Protractor.

4. REFERENCES

- A. USATECOM Regulation 385-6, Verification of Safety of Material During Testing.
- B. USATECOM Regulation 700-1, Quality Assurance.
- C. USATECOM Regulation 705-4, Equipment Performance Report.
- D. USAGETA (HEDGE), Human Factors Evaluation Data for General Equipment.
- E. MIL-STD-129, Marking for Shipment and Storage.
- F. MIL-STD-130, Identification Marking of U. S. Military Property.
- G. MIL-STD-461, Electromagnetic Interference Requirements for Equipment.
- H. MIL-STD-462, Electromagnetic Interference Characteristics Measurement of.
- I. MIL-STD-463, Definitions and Systems of Units - Electromagnetic Interference Technology.
- J. MIL-STD-810B, Method 516 Shock Tests.
- K. MIL-P-18058, Preparation for Delivery of Machine Tools (Metal and Woodworking) Accessories and Repair Parts.
- L. TB MED 251, Noise and Conservation of Hearing, Department of the Army.
- M. HEL STD S-1-63B, Maximum Noise Level for Army Materiel Command Equipment.
- N. ASA S1.4 - 1961, General Purpose Sound Level Meters.
- O. ASA S1.2 - 1962, Physical Measurement of Sound.
- P. NEMA MG-1, National Electrical Manufacturer's Association, Tests and Performance - AC and DC Fractional and Integral Horsepower Motors Part 12, 1966.
- Q. NEMA IC-1, Standards for Industrial Controls.
- R. MTP 9-2-503, Durability.
- S. MTP 10-2-500, Physical Characteristics.
- T. MTP 10-2-501, Operator Training and Familiarization.
- U. MTP 10-2-503, Surface Transportability (General Supplies and Equipment).
- V. MTP 10-2-505, Human Factors Evaluation.
- W. MTP 10-2-507, Maintenance Evaluation.
- X. MTP 10-2-508, Safety.

5. SCOPE

5.1 SUMMARY

This materiel test procedure describes the following tests to be conducted on sanders:

- a. Preparation for Test - A determination of the condition of the test item and adequacy of packaging upon its arrival and other preparatory procedures to be completed prior to the start of active testing.
- b. Operational Performance - An evaluation to examine specific operational design characteristics including the test item's ability to perform its primary function. Test item controls and indicators will also be evaluated and checked.
- c. Electromagnetic Interference - An evaluation to determine the degree to which the test item produces radiated or line conducted interference.
- d. Durability - An evaluation of the test item's ability to retain original physical and performance characteristics after extended operation.
- e. Transportability - An evaluation to determine the ability of the test item and its container to withstand the forces which it will experience during normal handling and transporting.
- f. Maintainability and Reliability Evaluation - That portion of the test which is concerned with the following: verification and appraisal of failures; determination and appraisal of maintenance characteristics and requirements; appraisal of design-for maintainability; appraisal of the maintenance test package; and, calculation of indicators which express the effects of the preceding aspects.
- g. Safety - An evaluation to determine the safety characteristics and possible hazards of the test item and to provide data to be used in issuing a safety release.
- h. Human Factors - An evaluation to determine the adequacy of the design and performance characteristics of the test item and associated equipment in terms of conformance to accepted human factors engineering design criteria.
- i. Value Analysis - An evaluation directed at analyzing the primary functions and features of the test item for the purpose of reducing the cost of the test item without compromising the desired performance and safety characteristics.

5.2 LIMITATIONS

The procedures of this MTP are limited to testing of electrically powered, motor-driven belt or disk sanders.

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Initial Inspection

6.1.1.1 Shipping and Packaging Inspections

a. Examine the shipping method, preservation, and packaging and record the following:

- 1) Non-conformance with MIL-P-18058.

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- 2) Evidence of damage or deterioration to packaging or shipping components and materials.
- 3) All identification markings.

NOTE: The container shall be marked in accordance with MIL-STD-129.

- 4) Discrepancy between titles of all printed material accompanying the test item and printed material with test item markings.

b. Remove the test item from its shipping container, if applicable, and record the following:

- 1) Equipment, time and personnel required.
- 2) Comments regarding the method and materials used to secure the test item.

6.1.1.2 Test Item Inspection

a. Visually inspect the test item and record the following:

- 1) Any noncompliance of the markings on the test item with MIL-STD-130.
- 2) Evidence of damage or wear.
- 3) Evidence of defects in manufacturing, materials, or workmanship. In particular the following should be considered:
 - a) Metal surfaces shall be treated for rust and painted in accordance with the best commercial practice. Paint shall be smooth and uniform without runs and sags.
 - b) Component junctions.
 - (1) Rivets shall be of a size to completely fill holes and allow for a sufficient flare over.
 - (2) Soldering shall be smooth, sound and clean.
 - (3) Welding shall be free from slag, cracks, fractures and have a smooth, clean appearance.
 - (4) Hardware shall be of sufficient size and strength and be tightly drawn.
 - (5) Seams, joints and edges shall have a good fit and alignment and there shall be no sharp edges or burrs.
 - c) All controls, indicators, access ports and points of attachment shall be marked clearly and legibly as to their function.
 - d) That all doors and covers have the proper fit and operate easily.

b. Examine the test item and record nonconformance with the following standards:

- 1) Motors shall be in accordance with NEMA MG-1
- 2) Controls and indicators shall conform to NEMA IC-1

c. Inspect for and record improperly protected wiring and inadequate grounding.

- d. Check all electrical cables and connectors and record for damage.
- e. Check for existence of proper guards and safety provisions.

6.1.2 Inventory Check

a. Verify completeness of the test item and associated maintenance package and material with the Basic Issue Item List (BIIL) and record all shortages.

- b. File an Equipment Performance Report (EPR), as required.

6.1.3 Physical Characteristics

Determine the physical characteristics of the test item by performing the applicable procedures of MTP 9-2-500 and the following:

a. Place the straightedge in at least (2) directions at right angles to one another overlapping the edges of the test item table top.

- b. Check for flatness with the feeler gauges.
- c. Record the readings obtained.

6.1.4 Operator Training and Familiarization

Orient test personnel using the applicable procedures of MTP 10-2-501 and record all pertinent data.

6.1.5 Pre-Operational Checks

Prepare the test item for operation as directed in the draft technical manuals and as follows:

a. Remove all preservation from the test item and attach any devices, etc. which are removed from the test item for transporting convenience.

b. Check all electrical, mechanical, and hydraulic controls for freedom and smoothness of operation.

c. Check adjustment mechanisms for smoothness of adjustments and to ensure that they are sufficiently secure to avoid any undesirable effects due to vibration.

d. Verify complete lubrication of the test item. Inspect test item to ensure that all oil holes and grease fittings are accessible to service but designed to exclude foreign material.

- e. Check oil safety devices.

f. Record adequacy of draft technical manual in respect to preparation for initial operation.

6.2 TEST CONDUCT

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NOTE: Prepare an Equipment Performance Report for all equipment failures or incidents of an abnormal nature.

During the conduct of all tests, test personnel shall observe the proper safety precautions and in particular, shall adhere closely to the manufacturer's instructions for the handling and use of the test item.

6.2.1 Operational Performance

The following tests will be performed on the test item when applicable:

6.2.1.1 Preliminary Electrical Tests

- a. Without power leads connected to the test item, set the power control to the "on" position.
- b. Using an ohmmeter, check that each power lead is ungrounded and that the earth or building ground lead is connected to the test item housing. Where multiple power input locations exist, repeat the test at each location.
- c. Determine the direct current resistance of each motor winding of each motor by performing the following:

NOTE: Where there are shunt components with lower voltage ratings than the test voltage these may be disconnected.

- 1) Isolate the motor leads.
 - 2) Using a Wheatstone bridge, measure and record the resistance of each winding.
 - 3) Measure and record the ambient temperature.
- d. Reconnect the motor(s) power leads.
 - e. Using a megohmmeter, measure and record the insulation resistance between each winding with its associated circuit and the test item case with all other circuits connected to the test item case. Repeat the test for each motor.
 - f. Using a dielectric strength tester, test each electrical circuit by applying the test voltage between the circuit and ground with all other circuits connected to ground. (See NOTE of step c)

NOTE: The procedure and voltage used will depend on the motor found in the circuit. See Appendix A for the applicable requirements.

6.2.1.2 Vibration (dynamic balance) Test and Power Consumption

- a. Connect power leads through a wattmeter to the test item and apply power.
- b. Set the speed control to its maximum position.
- c. Measure and record the amplitude of vibration at various surfaces of the test item.
- d. Record the wattmeter reading.

6.2.1.3 Disk and/or Belt Operating Speed

a. Couple the tachometer wheel of a voltage generating rotary tachometer to the disk and/or belt and measure and record the rotary and linear speeds.

6.2.1.4 Operational Check

a. Operate the test item without load.
b. Check all controls, adjustments and mechanisms for proper operation and record evidence of malfunctions.
c. Determine and record adequacy of operational instructions of the technical manual.

6.2.1.5 Performance Test

Perform the following:

a. Using samples of material blocks, (wood, etc.) perform sanding operations for various disk table tilt settings.
b. Measure the sanded angle and record the measured reading and the setting indicated by the sander (degrees).
c. Using samples of material blocks, perform sanding operations for various settings of the belt table.
d. Measure and record the sanded angle and the angle indicated by the sander.
e. Move the belt sander assembly through various tilts and perform sanding operations at approximately every 15°.
f. Check the belt tensioning and tracking by the following:
1) Disalign the abrasive belt on the belt drums.
2) Realign the belt using the tensioning and tracking devices.
3) Perform sanding operations for not less than one hour and note there is no loss of tension or alignment.

6.2.1.6 Dust Collector Test

a. Measure and record the weight of a block of wood.
b. Perform sanding operations removing approximately 30% of the block's volume.
c. Weigh the contents of the dust collector and the block again. Record the (2) weights.

6.2.2 Electromagnetic Interference

Subject the test item to the applicable electromagnetic interference procedures of MIL-STD-462, for class IIB equipment, using the equipment as described by MIL-STD-461.

NOTE: General interference definitions etc. are described in MIL-

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STD-463.

6.2.3 Durability

Determine the durability of the test item by performing the applicable procedures of MTP 9-2-503 and the following:

a. Apply power to and run the test item continuously for (8) hours at its maximum rate.

NOTE: In the event of equipment failure during the durability test, the procedures of the maintenance section will be performed and the durability test rerun following repair of the test item.

b. For a minimum of (15) minutes each hour, perform sanding operations continuously with all controls and adjustments cycled through their range of operation.

c. At the end of the (8) hour period examine the test item for signs of accelerated wear and potential equipment failures. Include the following:

- 1) Damage to any component, material or finish
- 2) Loss of any adjustments or control
- 3) Excessive temperature at any location
- 4) Loosening of hardware, breaks in welds, etc
- 5) Slippage or loose components
- 6) Other need for maintenance.

d. For each defect revealed in step c, record the nature of the defect, the location on the test item, cause (if known) and recommended remedy.

e. Repeat electrical measurements of paragraph 6.2.1.1.

NOTE: Measurements should be made immediately after completion of the eight hour durability test run before the motor cools.

6.2.4 Transportability

a. Prepare the test item for transport as directed in the draft technical manual and subject it to the applicable sections of MTP 10-2-503.
b. Upon completion of each phase of the test perform the following:

- 1) Examine and record the extent of physical damage which the exterior of the test item container exhibits.
- 2) Remove the test item from its container and observe and record the following:
 - a) Broken bracing or damaged packing material
 - b) Undesirable shifting in the contents
 - c) Loose, free or broken materials or components

- 3) Visually inspect the test item and record evidence of damage.
- 4) Operate the test item under normal conditions and record evidence of any change in performance.

6.2.5 Maintainability and Reliability Evaluation

Evaluate the maintenance-related factors of the test item as described in MTP 10-2-507 with emphasis on the following:

- a. Organizational, Direct Support (DS), and General Support (GS) Maintenance requirements.
- b. Operator through General Support Maintenance literature.
- c. Repair parts.
- d. Tools.
- e. Test and Handling equipment.
- f. Calibration and maintenance facilities.
- g. Personnel skill requirements.
- h. Maintainability.
- i. Reliability.
- j. Availability.

6.2.6 Safety

Evaluate the safety characteristics and features of the test item by performing the applicable procedures of MTP 10-2-508 and the following:

- a. Review carefully any safety statement provided for the item.
- b. Throughout testing examine the test item for and record any conditions that might constitute a safety hazard and recommendation to eliminate the hazard.
- c. Prepare a list of all safety devices used on the test item. For each device listed, a minimum of ten cycles of operation will be caused by simulating the type failure which the device is to detect. Record the following:
 - 1) The device/feature tested
 - 2) Failure which the device is to detect
 - 3) Proper operation of the device or failure detected
- d. Examine the test item for the following and record any discrepancies:

- 1) Electrical parts shall be so located or enclosed so that suitable protection against accidental contact with uninsulated energized circuits is provided.
- 2) All internal wiring shall be protected against heat and contact with moving parts.
- 3) Where connections are made to internal wiring a barrier type terminal board or equivalent shall be used for secure lead attachment and protection against accidental contact of leads attached adjacent to each other.
- 4) Where line cords are used they shall be of sufficient current carrying capacity, shall be protected against rubbing at access ports by insulated bushings and shall be sufficiently strain.

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- relieved to withstand approximately five pounds of pull.
- 5) Where line fuses are used they shall be of a value consistent with the requirements of the test item.
 - 6) Where switches are used they shall be of sufficient current capacity and mounted so as not to allow movement.
 - 7) All metal parts shall be electrically bonded and grounded to prevent static electrical buildup.
 - 8) The materials used in the motors shall be inherently non-flammable and nonexplosive.
 - 9) Where the normal operating temperature of the motor(s) shall be sufficient to cause a burn the motor shall have a plate attached stating this fact.
 - 10) All moving parts of the set shall be enclosed to avoid accidental contact when the test item is in its operating position.
 - 11) All propellers or impellers shall be securely attached to the motor shafts.
 - 12) All external surfaces and internal surfaces (those exposed during maintenance) shall have no sharp edges.
 - 13) Where a thermal overload is provided for a motor it shall be tested for operation and the method of reset (manual or automatic) verified.
 - 14) The blades or impellers and shafting shall be sufficiently strong and designed with adequate clearance to prevent contact with casings or prevent distortion under conditions of deposit loading or other factors.
 - 15) Where capacitors are used they shall be housed in a suitable enclosure which will provide protection and also prevent the emission of flame or molten material in the event of a failure.

e. Record the absence of any safety features and suggestions for additional safety devices which will improve the safety characteristics of the test item.

6.2.7 Human Factors Evaluation

6.2.7.1 General Evaluation

Throughout the test evaluate the human factor characteristics of the test item by performing the applicable procedures of MTP 10-2-505 and the following:

a. Prepare task/item checklists to evaluate the human factors characteristics using the criteria of Human Factors Evaluation Data for General Equipment (HEDGE) and including the following considerations:

- 1) Operability:
 - a) Assemble and set up
 - b) Prepare for use
 - c) Activate/deactivate and perform prime function

2) Maintainability:

- a) Perform routine maintenance
- b) Detect malfunction and isolate and identify cause
- c) Remove defective component and replace or repair

b. Evaluation of the tasks of step a shall include but not be limited to the following:

- 1) Adequacy of instructions and tools to perform the task
- 2) Mental and physical effort required
- 3) Design of the test item as it affects the task
- 4) Time required for the task
- 5) Personnel required for the task

6.2.7.2 Noise Evaluation

NOTE: Where size permits and facility is available, the test should be conducted in a sound anechoic chamber. There should be no obstruction between the sound sensor and the test item.

a. Calibrate the sound level meter, and octave band noise analyzer and set the weighing network switch to the "flat response" on C position.

b. With the test item in its normal operating mode, determine the highest sound pressure level in each band (See Table I) at measuring locations 20° apart along a circular path whose radius is approximately ten feet measured to the approximate geometric center of the test item.

NOTE: The sensor should be encased in a sound absorbing enclosure which is open only on the side facing the test item. This will minimize indirect reflections to the detection device.

c. For the point of highest sound pressure in each band determine also the ambient noise level (test item inoperative).

d. Draw a diagram of the test site and indicate the test item location and orientation and the points at which measurements were made.

6.2.8 Value Analysis

During the conduct of all tests, personnel shall examine the materials, construction and design of the test item from a value standpoint in an effort to affect cost reduction of the test item. USATECOM Regulation 700-1 shall serve as a basis for this evaluation. Perform the following:

a. Examine the test item in the following cost reduction areas:

- 1) Deletion of ineffective or unnecessary features or components.
- 2) Substitution of less expensive but comparable component or material.
- 3) Changes in the design to reduce the cost of manufacturing.

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TABLE I
SERIES 2 FREQUENCY ANALYSIS

BAND	FROM	TO	CENTER FREQUENCY*	MAX. STEADY STATE NOISE LEVEL
1	45	90	63	119
2	90	180	125	114
3	180	355	250	107
4	355	710	500	99
5	710	1400	1000	91
6	1400	2800	2000	89
7	2800	5600	4000	89
8	5600	11,200	8000	91

*Defined as geometric mean of cut-off frequencies.

b. Examine all proposals to determine that the performance and safety characteristics have not been lowered.

c. Record the following for each suggested change:

- 1) Component of feature involved.
- 2) Suggested change.
- 3) Reasons for suggestion.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Initial Inspection

6.3.1.1.1 Shipping and Packaging Inspection -

Record the following:

- a. Any noncompliance with the standards for shipping, marking, preservation and packaging.
- b. Evidence of damage or deterioration to packaging or shipping components and materials.
- c. Identification markings.
- d. Discrepancies between titles of all printed material accompanying the test item and printed material with test item markings.
- e. Equipment, time and personnel required to remove test item from shipping container.
- f. Comments regarding the method and materials used to secure the

test item.

6.3.1.1.2 Test Item Inspection -

Record the following:

- a. Any noncompliance of markings on the test item with MIL-STD-130.
- b. Evidence of damage or wear.
- c. Evidence of defects in manufacturing, materials or workmanship.
- d. Any instance of noncompliance with the NEMA standards for motors and controls.
- e. Evidence of improperly protected wiring and inadequate grounding.
- f. Damaged or insecurely mated electrical cables and connectors.
- g. Lack of proper guards and safety provisions.

6.3.1.2 Inventory Check

Record shortages in the test item and maintenance package.

6.3.1.3 Physical Characteristics

Record the following:

- a. Data collected as described in the applicable sections of MTP 10-2-501.
- b. Feeler gauge readings.

6.3.1.4 Operator Training and Familiarization

Record pertinent data collected as described in MTP 10-2-501.

6.3.1.5 Pre-Operational Checks

Record the following:

- a. Controls and adjustments which do not operate smoothly.
- b. Adjustments which are not sufficiently secure to avoid any undesirable effects due to vibration.
- c. Oil holes or grease fittings which are not easily accessible or are not designed to exclude foreign material.
- d. Adequacy of draft technical manuals in respect to preparation for initial operation.

6.3.2 Test Conduct

6.3.2.1 Operational Performance

6.3.2.1.1 Preliminary Electrical Tests -

Record the following:

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- a. Improperly wired power leads.
- b. For each motor winding:
 - 1) Identification of motor
 - 2) Identification of winding
 - 3) Resistance in ohms
 - 4) Ambient temperature in °F.
- c. The insulation resistance in megohms for each circuit.
- d. Identification of any circuits which fail the dielectric strength test.

6.3.2.1.2 Vibration and Power Consumption -

Record the following:

- a. For each vibration measurement:
 - 1) Location of measurement on the test item
 - 2) Vibration amplitude in inches
- b. The wattmeter reading in watts

6.3.2.1.3 Disk and/or Belt Operating Speed -

Record the following:

- a. The disk speed in R.P.M.
- b. The belt speed in F.P.M.

6.3.2.1.4 Operational Check -

Record the following:

- a. Identification of all controls, adjustments, and mechanisms which fail to function properly.
- b. Adequacy of operational instructions in the technical manual.

6.3.2.1.5 Performance Test

Record the following:

- a. For each sample block sanded:
 - 1) Sanding table used (disk, belt)
 - 2) Type of sample block (wood, etc.)
 - 3) Indicated angle on sander in degrees
 - 4) Angle sanded in degrees
- b. Any difficulties in performing sanding operations for various

tilts of the belt sander assembly.

- c. Loss of tension or alignment during the belt tracking check.

6.3.2.1.6 Dust Collector Test -

Record the following:

- a. Initial weight of the test block in ounces, W1.
- b. Final weight of the test block in ounces, W2.
- c. Weight of the dust in the collector in ounces, W3.

6.3.2.2 Electromagnetic Interference

Record data collected as described in the applicable sections of MIL-STD 462.

6.3.2.3 Durability

Record data collected as described in the applicable sections of MTP 9-2-503 and the following:

- a. For each defect revealed:
 - 1) Nature of defect (Component damage, loose components, etc.)
 - 2) Location
 - 3) Cause (if known)
 - 4) Recommended remedy
- b. Electrical measurements as described in paragraph 6.2.1.1.

6.3.2.4 Transportability

Record data collected as described in the applicable sections of MTP 10-2-503 and the following:

- a. For the test item container:
 - 1) Damage to exterior of package
 - 2) Broken bracing or damaged packing material
 - 3) Undesirable shifting of contents
 - 4) Loose, free, or broken material on components
- b. Visible evidence of damage to the test item
- c. Change in operational performance

6.3.2.5 Maintainability and Reliability Evaluation

Record data collected as described in the applicable sections of MTP 10-2-507.

6.3.2.6 Safety

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Record data collected as described in the applicable sections of MTP 10-2-508 and the following:

- a. For test item:
 - 1) Conditions which constitute a hazard
 - 2) Recommendations to eliminate hazard
- b. For each safety device/feature:
 - 1) Name of device
 - 2) Type of test item failure which makes device necessary
 - 3) Malfunctions of safety device
- c. Discrepancies in the design of the test item which might produce a safety hazard.
- d. Missing safety features.
- e. Suggested additions to the test item's safety features.

6.3.2.7 Human Factors Evaluation

6.3.2.7.1 General Evaluation -

- a. Record data collected as described in the applicable sections of MTP 10-2-505.
- b. Retain completed HEDGE checklists

6.3.2.7.2 Noise Evaluation -

- a. Record the following:
 - 1) For measurements with the test item in operation:
 - a) Location of measurement
 - b) Maximum sound pressure in each band at each point
 - 2) For ambient sound pressure:
 - a) Point of highest sound pressure in each band
 - b) Maximum ambient sound pressure in each band
- b. Retain diagram of test setup.

6.3.2.8 Value Analysis

Record the following:

- a. The component or feature involved
- b. Suggested change
- c. Reasons for the suggested change

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 General

Summarize all data using tabulations and/or charts and graphs, as applicable. The data will be analyzed to determine the extent the test item and maintenance package meet the requirements of the QMR's, SDR's, and detailed specifications of the test item. All diagrams and photographs should be properly identified.

6.4.2 Operational Performance

6.4.2.1 Preliminary Electrical Tests

Present the results of the test in tabular form indicating for each motor, its winding, resistance, insulation resistance and dielectric strength test completion. Show results of insulation resistance and dielectric strength tests for all other circuits.

6.4.2.2 Performance Test

For each sample block determine the difference in the sanded angle measured on the block to that indicated on the machine.

6.4.2.3 Dust Collector Test

Determine the efficiency of the dust collection system by calculating the following:

$$\text{efficiency in \%} = \frac{W_3}{W_1 - W_2} \times 100$$

6.4.3 Electromagnetic Interference

Prepare a table showing the interference test conducted, out of limit readings, or the highest reading in the band and the corresponding frequency. Consult the graphs of MIL-STD-461 for maximum allowable readings.

6.4.4 Durability

- a. Analyze all abrupt changes in test item indicators for a possible malfunction.
- b. Compute change in the post-test dielectric strength and insulation resistance checks.
- c. Calculate the final temperature of each motor by using the initial and final resistance values of the motor windings as follows:

$$t_f = \frac{R_{t_1}}{R_1} (C + t_r) - C$$

where:

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t_r = room temperature of the winding in °C
 R_{t_1} = the final resistance value of the winding, in ohms
 R_1 = the initial resistance value of the winding, in ohms
C = 234.5 for copper windings and 221 for aluminum windings

d. Compare the temperature rise with the insulation class to determine an excessive temperature change.

Class A insulation - not more than 40°C rise
Class B insulation - not more than 60°C rise
Class C insulation - not more than 15°C rise

e. List any indications of accelerated wear of the test item as determined by visual inspection.

6.4.5 Safety

A Safety Release Recommendation shall be submitted in accordance with USATECOM Regulation 385-6 based on data collected related to safety.

6.4.6 Human Factors Evaluation

Prepare a table showing measurement locations, the highest noise readings in each band and the ambient noise. Include a column for corrected noise readings with the new readings to be determined in the following manner:

- If the difference between the noise reading and the ambient reading is 3 decibels or less, mark corrected reading "indeterminate".
- If the difference is between 4 and 10 decibels consult Table II.
- If the difference is greater than 10 decibels, no corrections necessary.
- Determine those readings which are out of limit by comparing results with Table II which contains the allowable limits as given by HEL Standard S-1-63B, Maximum Noise Level for Army Material Command Equipment.

TABLE II
CORRECTIONS FOR AMBIENT SOUND PRESSURE LEVELS

Difference in decibels between sound pressure level measured with sound source operating and ambient sound pressure level alone.	4	5	6	7	8	9	10
Correction, in decibels, to be subtracted from sound pressure level measured with sound source operating to obtain sound pressure level due to sound source alone.	2.2	1.7	1.3	1.0	0.8	0.6	0.4

APPENDIX A

MOTOR DIELECTRIC STRENGTH TESTS

General Requirements: This specification is applicable before and after a prolonged run period. The frequency of the test voltage shall be 25-60 Hz and the peak value shall be the specified test voltage multiplied by 2. The test voltage shall be applied for (1) minute except that an equivalent test can be conducted for (1) second if the test voltage is 1.2 times that voltage used for the (1) minute test.

Motor Types

- A. Universal Motors - The high potential test for all motors regardless of horsepower and for operation upon circuits not exceeding 250 volts shall be made by applying 900 VRMS.
- B. Direct Current and Induction Motors -
 - 1. Motors rated 1/2 horse power and larger.
 - a. Apply 1000 VRMS plus twice the rated voltage of the motor windings.
 - b. For motors with armatures or rotors with insulated windings not connected to the line apply 1000 VRMS.

Exception: The standard test voltage for secondary windings of wound rotors of induction motors shall be 1000 VRMS plus twice the maximum voltage induced between slip rings on open circuit at standstill (or running if under this condition the voltage is greater) with primary voltage applied to the stator terminals as in service. Since the voltage induced in the rotor is a function of both the speed of the rotor and the voltage impressed on the stator, the test voltage applied to the rotor shall be determined from that combination of those two conditions which give the highest voltage induced in the rotor.
For reversing motors the test voltage shall be 1000 VRMS plus four times the maximum voltage induced between slip rings on open circuit at standstill with rated primary voltage applied to the stator terminals.

- 2. Motors Rated at Less than 1/2 Horsepower
 - a. For motors rated less than 1/2 horsepower and operated by circuits of less than 250 volts the test voltage shall be 900 VRMS. Above 250 volt operation the test voltage shall be 1000 VRMS plus twice the motor rated voltage.
 - b. For motors rated less than 1/2 horsepower where armatures or rotors

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have insulated windings not connected to the line the test voltage shall be 900 VRMS.