INCH POUND
MIL-B-53090(ME)
28 March 1989

MILITARY SPECIFICATION

BLADE, MINE CLEARING

This specification is approved for use within the USA Belvoir Research, Development and Engineering Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Purpose. This specification defines the mine clearing blade system (MCBS) which is mounted on the M1 series main battle tanks.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

A-A-884 - Tape Pressure Sensitive Box Closure.
A-A-1830 - Tape, Pressure-Sensitive Adhesive, Box Closure.
TT-C-490 - Cleaning Method and Pretreatment of Ferrous Surfaces for Organic Coatings.
VV-D-1078 - Damping Fluid, Silicone Base (Dimethyl Polysilamne).
PPP-T-60 - Tape, Packaging, Waterproof.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.

MILITARY

MIL-C-104 - Crates, Wood; Lumber and Plywood Sheathed Nailed and Bolted.
MIL-P-116 - Preservation, Methods of.
MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed Flexible.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 2590

MIL-P-514	- Plates, Identification, Instruction and Marking, Blank.
MIL-B-46176	- Brake Fluid, Silicone, Automotive, All Weather, Operational and Preservative.
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-P-52192	- Primer Coating, Epoxy.
MIL-P-53022	- Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free.
MIL-P-53030	- Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free.
MIL-C-53039	- Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant.

STANDARDS

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	- Marking for Shipment and Storage.
MIL-STD-130	- Identification Marking of U.S. Military Property.
MIL-STD-193	- Paint Procedures and Marking for Vehicles, Construction Equipment and Material Handling Equipment.
MIL-STD-209	- Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment.
MIL-STD-210	- Climatic Extremes for Military Equipment.
MIL-STD-454	- Standard General Requirements for Electronic Equipment.
MIL-STD-810	- Environmental Test Methods.
MIL-STD-882	- System Safety Program Requirements.
MIL-STD-889	- Dissimilar Metals.
MIL-STD-1186	- Cushioning, Anchoring, Bracing, Blocking and Waterproofing; with Appropriate Test Methods.
MIL-STD-1472	- Human Engineering Design Criteria for Military System, Equipment and Facilities.
MIL-STD-1791	- Design for Internal Aerial Delivery in Fixed Wing Aircraft.
MIL-STD-45662	- Calibration Systems Requirements.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

ME

TA 13228E5945 - Ml Mine Clearing Blade System.

(Unless otherwise indicated, copies of federal and military specifications standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.

(Application for copies should be addressed to the American Society of Engineers, 3354 East 47th Street, New York, New York 10017.)

AMERICAN WELDING SOCIETY, INC. (AWS)

D1.1 - Structural Welding Code, Steel.
D1.2 - Structural Welding Code, Aluminum.

(Application for copies should be addressed to the American Welding Society, Inc., 550 N.W. LeJeune Road, P. O. Box 351040, Miami, FL 33126.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 653 - Soil and Rock, Standard Term and Symbols Relating to.
ASTM D 2000 - Rubber Products in Automotive Applications, Classification Systems for.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

ASSOCIATION OF AMERICAN RAILROADS (AAR)

Section 6 - Rules Governing the Loading of Department of Defense Materiel on the Open Top Cars.

(Application for copies should be addressed to the Association of American Railroads, 1920 L Street NW, Washington, DC 20036.)

(Non-Government standards and other publications are normally available from the organizations that prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. The M1 mine clearing blade system (M1 MCBS) is an electromechanically operated plow installed on the front of the M series rain battle tank (M1 series MBT). When in use the Ml MCBS clears the two tank track paths of anti-tank mines by moving the mines to the outside of the vehicle track. The Ml MCBS' dogbone assembly will detonate tilt-rod mines in front of the M1 MBT path. Requirements for the M1 MCBS shall be in accordance with TA 1322BE5945.

3.2 Drawings. The drawings forming a part of this specification are end product drawings. No deviations from the prescribed dimensions or tolerances are permissible without prior approval of the contracting officer, (see table I, examination schedule). Where tolerances could cumulatively result in incorrect fits, the contractor shall provide tolerances within those prescribed on the drawings to insure correct fit, assembly, and operation of the MCBS. Any data (e.g. shop drawings, layouts, slow sheets, processing procedures, etc.) prepared by the contractor or obtained from a vendor to support fabrication and manufacture of the production item shall be made available, upon request, for inspection by the contracting officer or designated representative

3.3 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspections (see 4.4 and 6.3). Any changes or deviations of the Ml MCBS from the approved first article during production will be subject to the approval of the contracting officer. Approval of the first article will not relieve the contractor of his obligation to furnish a M1 MCBS conforming to this specification.

3.4 Qualification of component. No deviation from vendor item specified in the source control drawings is permissible without prior approval of the contracting officer or his designated representative in accordance with (IAW) procurement documentation.

3.5 Materials. Materials shall be as specified in the drawings, referenced specifications and standards. Materials shall be free of defects. All materials shall be new. Rubber products shall not be more than eight calendar quarters in age from date of cure of the rubber to date of acceptance of the M1 MCBS by the Government. All new rubber components which are under tension or which may be flexed shall be ozone resistant as specified in ASTM D 2000, (see table I, examination schedule).

3.5.1 Materials deterioration prevention and control. The M1 MCBS shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that ray be encountered in any of the applicable operating and storage environments to which the M1 MCBS my be exposed, (see table I, examination schedule).

3.5.2 Identification of materials and finishes. The contractor shall identify the specific material, material finish or treatment for use with component and subcomponent when options are given on the drawings. This information shall be wade available upon request to the contracting officer or designated representative, (see table I, examination schedule).

3.5.3 Dissimilar metals. Dissimilar metals shall riot be used in intimate contact with each other unless protected against galvanic corrosion. Dissimilar metals and methods of protection are defined and detailed in MIL-STD-889.

3.6 Safety. All exposed parts that are subject to high operating temperatures or that are energized electrically shall be insulated, fully enclosed, or guarded. Requirements of MIL-STD-882 and MIL-STD-454 requirement 1 shall apply, (see table I, examination schedule).

3.6.1 Cautions and warnings. Caution and warning markings as required in system drawings shall be clearly stenciled on Ml MCBS to ensure maximum awareness of potential hazard, (see table I, examination schedule).

3.7 Human factors engineering. The M1 MCBS shall conform to human factors engineering design criteria as described in MIL-STD-1472. Special design emphasis shall be given, but not limited to paragraph 4 (General requirements), 5.5 (Labeling), 5.6 (Anthropametry), 5.9 (Design for Maintainability), and 5.13 (Hazards and Safety) of MIL-STD-1472, as applicable.

3.8 Mounting requirements.

3.8.1 Mounting. The Ml MCBS shall be mounted on the M1 series MBT by four personnel in less than an hour with the assistance of a lifting device. No modifications to the M1 series tank are permitted for MCBS installation. The power cable shall be of sufficient length to permit full unrestricted opening of the driver's batch with the power cable connected to the M1 series MBT NATO receptacle and the MCBS control box, (i.e. power cable installed), (see 4.7.2).

3.8.1.1 Mounting of the moldboard extentions. All moldboard extensions shall be assembled in less than five minutes, (see 4.7.2.2).

3.9 Interface requirements.

3.9.1 Moldboards. When in the travel mode, M1 MCBS shall not restrict the full operation of the M1 series tank's main gun system in its lower depression angle, (see 4.7.2.3).

3.9.2 Main electrical harness and control box interface. When mounted, the interface between the rain electrical harness and control box and the M1 series MBT shall be sealed to conform to the water fording and the Nuclear, Biological and Chemical (NBC) requirements of the Ml series MBT. The crew compartment pressure shall be maintained at 3.7 in (9 cm) of water, (see 4.7.2.4).

3.10 Operational requirements.

3.10.1 Lifting and lowering mechanism. The total time required to raise both, right and left, moldboard assemblies from, the plowing to the travel position shall not exceed 20 seconds once the operator activates the electrical mechanism. The total time to drop both moldboard assemblies shall not be less than 10 seconds once the operator activates the electrical mechanism, (see 3.10.1 and 4.7.7).

3.10.2 Emergency release system. The driver shall be able to release each moldboard using the emergency release cables while inside the driver's compartment, (see 4.7.3). The force required for the operator to operate the emergency release cables shall not exceed MIL-STD-1472, 5.9.3.1.4 limits per 3.7 herein.

3.10.3 Emergency lifting. The total time required to raise each moldboard assembly from the plowing to travel position using the emergency lifting belts shall not exceed 25 seconds once the operator starts lifting the moldboards, (see 4.7.4).

3.10.4 Travel lock retention. Each travel lock mechanism shall serve as a latch to hold the moldboard assemblies into the raised position for travel while not plowing. The travel lock shall not disengage or be adversely affected when tested in accordance with 4.7.6.

3.11 Environmental requirements. The Ml MCBS shall operate in temperature extremes of 110 °F (43 °C) and -5 °F (-20 °C) in accordance with MIL-STD-210. The M1 MCBS shall experience cold soak temperature to -25 °F (-32 °C) when attached to the tank, (see 4.7.7). The M1 MCBS will plow on all terrain in which a tank can operate except frozen ground or extremely rocky terrain. Frozen ground is defined as soil exhibiting frost action per ASTM D 653. Extremely rocky terrain is defined as soil whose composition of rock equals or exceeds 30 percent by volume per ASTM D 653.

3.12 Performance characteristics. The Ml MCBS shall:

a. Have adjustable plow depths of: 8 in (20 cm); 10 in (25 cm); and 12 inches (30 cm), (see 4.7.5).
b. Neutralize 90 percent of the anti-tank mines and explosive devices from the area in front of the tank's track, (see 4.7.8). (Neutralize is defined as one of the following: crush, destroy, detonate or push aside).
c. Have an operational plow speed of 3-10 mph (5-16 kmh), mainly dictated by soil conditions, (see table IV).
d. Operate on uneven terrain (rolling terrain and 40 percent side slopes), (see 4.7.8).
e. Be capable of clearing mines while traversing fords as well as cross-country mine fields, (see 4.7.10).
f. Be capable of withstanding rain and humidity without preparation, (see 4.7.11).

3.13 Reliability and maintainability.

3.13.1 Reliability. The M1 MCBS shall be designed to have mean time between failure of at least 80 hours exclusive of failure caused by mine detonation, (see 4.7.8).

3.13.2 Mission reliability. The Ml MCBS shall have a mission reliability of .90 probability of completing a mission. A mission shall consist of the following:

a. Install M1 MCBS on the Ml series MBT.
b. Advance forward to mine field area.
c. Release the moldboards to drop into a plowing position.
d. Proceed forward to plow 982 feet (300 meters) at required depth and plowing speeds.
e. Energize the lifting/lowering mechanism and raise plow to travel position, engaging travel locks and locking the Ml MCBS in travel position.

f. Travel 654 feet.(200 meters) forward.
g. Repeat steps c through f twice.
h. Travel minimum of 4.6 miles (7600 meters) to second minefield area.
i. Repeat steps c through f three times.
j. Operation is completed.

3.13.3 Maintainability. The Ml MCBS maintainability factors shall be in the limits according to the following:

Action	No less than	Not to exceed
MTTR (field level)		1 man-hour
MTTR (direct support)		1 man-hour
Max. corrective time (direct support)		2 man-hours
Lubrication (once to) Adjustments	4 operation hrs.	
Routine operator maintenance	4 operation hrs.	30 minutes

3.14 Lubricants. The M1 MCBS shall be capable of full performance utilizing a lubricant conforming to MIL-L- 46176 or silicon lubricant based in accordance with VV-D-1078 without adverse affect on Ml MCBS components, (see 4.7.12).

3.15 Treatment and painting. The Ml MCBS shall be finished or painted to provide a low infrared reflectance surface. All hardware not normally painted shall be treated to provide limited reflectivity. Normally painted surfaces shall be cleaned and treated conforming to TT-C-490, applicable method I type III (wash primer), 0.4-0.6 mil thick. Prime per MIL-P-52192, MIL-P-53030 or MIL-P-53022. Primer shall have a dry film thickness of 1.0 -1.5 mi1s. The final painted surfaces shall be color green 383 applied in two coats at least 1.8 mils which (total) without sags, runs or thin areas and shall conform to MIL-C-53039 or MIL-C-46168, (see table I, examination schedule and 4.7.13).

3.16 Construction.

3.16.1 Workmanship. The Ml MCBS shall have no evidence of cracks, burrs, sharp edges, loose parts, foreign matter or any other evidence of poor workmanship, (see table I, examination schedule).

3.16.2 Interchangeability. All parts, components and assemblies having the same part number shall be functionally and physically interchangeable, (see table I, examination schedule).

3.16.3 Weight. The weight of the M1 MCBS shall not exceed 8,000 pounds (3600 kg). Total weight of the Ml MCBS with all associated hardware and items of equipment including packaging/shipping containers shall not exceed 9750 pounds (4387 kg).

3.17 Marking. All M1 MCBS components shall be marked in accordance with the requirements of MIL-STD-130, (see table I).

3.17.1 Identification marking. The Ml MCBS shall be identified in accordance with MIL-P-514, type III, composition C or type III, grade A, class 1 material, (see table I, examination schedule). In addition to the information required, the plate shall be marked with the following:

US
NSN 2590-01-230-8862

3.18 Welders and welding.

3.18.1 Welding. The surfaces of parts to be welded shall be free from rust, oxides, scale, paint, grease, or other foreign matter. Weldment shall be of homogeneous appearance and form without spattering or other irregularities, complying with the size, configuration, and other dimensional requirements to develop the full strength of the parts joined by the welds. No cracks of any type are permitted. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings. All arc welding and welding procedures shall be in accordance with ASME Boiler and Pressure Vessel Code Section IX, AWS D1.1 or AWS D1.2 as appropriate, (see table I, examination schedule).

3.18.2 Welders. Before assigning any welder to welder or welding operator work covered by this specification, the contractor shall obtain certification that the welder has passed qualification tests as prescribed by one of the following listed codes for the materials joined and the type of welding operation to be performed and that such qualification is effective as defined by the particular code:

AWS D1. 1 Structural Welding Code - Steel
AWS D1.2 Structural Welding Code - Aluminum
ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

Contractors who rake only horizontal welds need not to qualify welders for "all position welding". In the event of evidence of poor welds, the Government reserves the right to require retesting of any welder or welding operator. The test results shall be made available for review by the contracting officer or the contracting officer’s representative, (see table I, examination schedule).

3.19 Transportability. The Ml MCBS shall be capable of being transported by military or commercial trailers, trains, vessels, aircraft and can withstand the impact forces encountered in shipment without damage or permanent deformation. The mine clearing blade shall be equipped with tiedown, and slinging provisions. The MCBS shall not be transported mounted on the Ml series main battle tank (i.e., it will always be shipped dismounted).

3.19.1 Tiedown provisions. The tiedown provisions shall conform to MIL-STD-209, class 2 or 3, type II equipment and to MIL-STD-1791 for equipment restraint criteria. The tiedown provisions shall satisfactorily complete the pull testing as specified without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural components, (see table I, examination schedule).

3.19.2 Slinging provisions. The slinging provisions shall conform to MIL-STD-209, class 1 or 3, type II. The provisions shall enable the complete M1 MCBS to be lifted in the normal operation position. The provisions shall be fastened to members which will withstand stresses in the amount and direction of pull specified for the provisions without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural components. Slinging provisions may also be used as tiedown provisions when such provisions meet the requirements specified in 3.19.1. All slinging/tiedown provisions shall be labeled "LIFT", “TIEDOWN” OR “LIFT/TIEDOWN”, as appropriate, in 1-in (2.54 cm) high letters, (see table I, examination schedule).

3.19.3 Air transportability. The mine clearing blade shall be air transportable in the C-130, C141, and C-5A aircraft. The mine clearing blade shall meet the requirements of MIL-STD-1791 for air transport, (see table I, examination schedule).

3.19.4 Rail transportability. The mine clearing blade shall be rail transportable in CONUS and NATO countries without restrictions. The M1 MCBS shall be capable of withstanding shock loads resulting from rail impact testing in accordance with 4.9.3 without failure, damage, or permanent deformation, (see table I, examination schedule).

3.19.5 Highway transportability. The mine clearing blade, when loaded on a semitrailer/tractor, shall be within the highway permit limits of all states, (see table I, examination schedule).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements, specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Disassembly inspection. Failure of the first article M1 MCBS components to meet the requirements of the first article examination outlined herein (see table I and table II) shall be cause for disassembly. The component(s) will be disassembled to the extent necessary to determine the cause of failure. This inspection shall be conducted in the presence of a Government representative. Each disassembled put shall be examined in detail for compliance with this specification and referenced drawings in regard to materials, dimensions, tolerances, and workmanship. Parts not comply with such

requirements shall be rejected and shall be cause for rejection of the first article MCBS components. Reassembly with replacement parts shall be the responsibility of the supplier.

4.1.3 Parts and components. Upon fabrication, parts and components shall be inspected for compliance with the reference specifications, standards, drawings, and tolerances shown on the drawings.

4.1.4 Inspection equipment. Unless otherwise specified in the contract, the contractor is responsible for the provision and maintenance of all inspection equipment necessary to assure that supplies and services conform to contract requirements. Inspection equipment must be capable of repetitive measurements to an accuracy of 10 percent of the measurement tolerance. Calibration of inspection equipment shall be in accordance with MIL-STD-45662, note 3.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection, see 4.4.
b. Quality inspection, see 4.5.
c. Inspection of packaging, see 4.8.

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions as specified in 4.7.

4.4 First article inspection. The first article inspection shall require at least two M1 MCBS to be inspected in accordance with table I and tested in accordance with table II. The first article inspection requirements are listed in the specific sequence required. After the break-in test the testing sequence may be altered as previously determined by a test plan. Each item selected for first article inspection shall complete the quality conformance inspection (see 4.5) and have any discovered defects corrected prior to initiating the first article inspection.

4.4.1 Final approval and acceptance. Final approval and acceptance by the Government of the first production M1 MCBS shall be withheld until the initial production test has been completed and a final determination has been made regarding conformity of the M1 MCBS to contractual/specifications requirements including, but not limited to, workmanship and materials.

4.5 Quality conformance inspection.

4.5.1 Sampling. Samples shall be selected in accordance with MIL-STD-105.

4.5.2 Examination. Samples selected in accordance with 4.5.1 shall be examined in accordance with 4.6.1. Acceptable quality level (AQL) shall be 1.0 percent defective for major defects and 2.5 percent for minor defects.

4.6 Inspection schedule.

4.6.1 Examination. Units for examination shall be examined in accordance with table I, examination schedule.

4.6.1.1 Examination conditions. Unless otherwise specified, conformance examination shall be performed by the contractor at the contractors location, and witnessed by the Government.

4.6.1.2 Examination procedures (first article). Two first article M1 MCBS selected at random, shall be examined in accordance with table I, examination schedule.

TABLE I. Examination schedule.

First Article	Quality Inspection	Characteristics		Requirement Paragraph
		MAJOR		
X	X	101.	Dimensions not as specified	3.2
X	X	102.	Parts and components not as specified.	3.2.3.4
X	X	103.	Materials not as specified.	3.5
X	X	104.	Materials are not resistant to corrosion or deterioration or treated to be made resistant to corrosion or deterioration for the applicable operating environment.	3.5.1
X	X	105.	Contractor does not have documentation available for identification of material.	3.5.2
X	X	106.	Dissimilar metals as defined in MIL-STD-889 are not effectively insulated from each other.	3.5.3
X	X	107.	Safety is not as specified.	3.6
X	X	108.	Human factors engineering not as specified.	3.7
X	X	109.	Mounting requirements not as specified.	3.8
X	X	110.	Interface requirements not as specified.	3.9
X	X	111.	Lubricants riot as specified.	3.14
X	X	112.	Treatment and painting not as specified.	3.15
X	X	113.	Surface finish inspection.	3.15
X	X	114.	Workmanship not as specified.	3.16.1
X	X	115.	Interchangeability not as specified.	3.16.2
X	X	116.	Welding procedure not as specified.	3.18.1
X	X	117.	Welds not as specified.	3.18.1
X	X	118.	Welding certification not as specified.	3.18.2
X	X	119.	Lifting and tiedown provisions not as specified on the drawings.	3.19.1, & 3.19.2
X	X	120.	Air transportability requirements not as specified.	3.19.3
X	X	121.	Rail transportability requirements not as specified.	3.19.4
X	X	122.	Highway transportability requirements not as	3.19.5
		123.	specified.	
		MINOR		
X	X	201.	Caution/warnings not as specified.	3.6.1
X	X	202.	Marking not as specified.	3.17
X	X	203.	Identification marking not as specified.	3.17.1

4.7 Tests. Units for first article inspection shall be tested in accordance with table II, test schedule.

TABLE II. First article inspection.

Inspection Procedure	Requirement Paragraph	Inspection Paragraph	Unit 1	Unit 2
Mounting test	3.8.1	4.7.2.1	X	X
Moldboards extensions mounting test	3.8.1.1	4.7.2.2	X	X
Moldboards interface test	3.9.1	4.7.2.3	X	X
Electrical hardness interface	3.9.2	4.7.2.3	X	X
Break-in	3.12.a and c	4.7.1	X	X
Emergency release	3.10.2	4.7.3	X	X
Emergency lifting mechanism actuation test	3.10.3	4.7.4	X	X
Plow depth test	3.10.b	4.7.5	X	
Travel lock retention test	3.10.4	4.7.6	X	X
High temperature test	3.11, 3.10.1	4.7.7.1	X	X
Low temperature	3.11, 3.10.1	4.7.7.2	X	X
Reliability test	3.13.1, 3.13.2	4.7.8	X	X
Maintainability test	3.13.3	4.7.9	X	X
Fording test	3.12.e	4.7.10	X	
Rain test	3.12.f	4.7.11		X
Lubrication inspection	3.14	4.7.12	X	X
Tiedown provisions	3.19.1	4.9.1	X	
Slinging provisions	3.19.2	4.9.2		X
Rail impact test	3.19.4	4.9.3	X	

4.7.1 Break-in. After completion of the inspections as listed in table I, examination schedule, each M1 MCBS shall be run for the distances specified in table III at the speeds indicated. The Ml MCBS shall be in the travel mode throughout the break-in run. The M1 MBCS shall be lowered and raised three times after each run. After completion of break-in, the M1 MCBS shall be inspected for evidence of damaged components or loss of adjustment. These shall be corrected prior to continuing first article inspection.

TABLE III. Speed and distance for break-in run .

Test conditions	Speed mph	Speed (kph)	Distance miles	Distance (km)
Cross country	0-10	(0-16)	3	(4.8)
Secondary road	10-20	(16-32)	5	(8.1)
Primary road	20-max	(32-max)	7	(11.3)

4.7.2 Performance tests.

4.7.2.1 Mounting test. The M1 MCBS shall be mounted to an M1 series tank using four personnel within one hour with the assistance of a lifting device. Timing for this test will begin with the M1 tank stopped three feet from the MCBS - which shall be in its stored position. Test will end when the blade has

been installed and operated to the travel position. After installed on the tank, the Ml MCBS shall be lowered and raised three times to ensure conformance to 3.10.1 herein.

4.7.2.2 Moldboard extensions mounting test. The moldboard extensions shall be installed within five minutes. Timing for this test will start as crew begins to remove extensions from their stored position.

4.7.2.3 Moldboards mounting test. To verify the M1 MCBS do not interfere with the full operation of Ml series tank main gun system in its lower depression angle, raise the moldboards to the travel mode and position the gun system in its lower depression angle.

4.7.2.4 Main electrical harness and control system test.

a. Water leakage test. With the driver inside the tank, 3 gallons of water will be sprayed over the adapter during a 3 minute period. The installed adapter will be checked for leakage with no leakage allowed.
b. NBC test. A Delta "P" transducer will be installed in the M1A1 tank. All hatches will be closed and locked and all other openings will be in the normal configuration. The main NBC system will be turned on and a reading will be taken to ensure that the vehicle maintains a minimum crew compartment pressure of 3.7 in. (9 cm) of water. Next, the power cable adapter block will be installed to the vision block opening and the main NBC system will be turned on. A reading will be taken to ensure that the vehicle maintains a minimum crew pressure of 3.7 in. (9 cm) of water.

The criteria will be considered met if, after the water leakage test, there is no sign of leakage to the inside compartment of the tank and if, after the NBC test, the crew compartment maintains a minimum pressure of 3.7 in. (9 cm) of water.

4.7.3 Emergency release actuation test. With the blade in the travel position and travel lock safety pin removed, the driver shall release both moldboards from inside the driver's compartment using the emergency release cables. Failure of the blade to fall to the plow position will constitute a failure.

4.7.4 Emergency lifting test. With the MCBS resting on the ground, crew members shall install lifting strap. Timing shall start when strap is installed and timing will end when blade is up into the travel locks.

4.7.5 Plowing depth test. The M1 MCBS shall be tested for adjustment to plowing at the stated depth requirements. Plow at least three times for 100 feet (30.77 meters) at each stated depth. Plowed area shall be checked to ensure the blade is plowing at set depth, 90 percent of the time. After plowing examine the MI MCBS for damage or malfunction.

4.7.6 Travel lock retention test. With the M1 MCBS in the travel mode, drive a minimum of 200 ft. (61.54 meters) at 30 mph (55 km) three times. For this test do not install the travel lock safety pin. After each operation examine the travel lock for proper alignment and retention of the moldboard assemblies.

4.7.7 Environmental tests.

4.7.7.1 High temperature test. The M1 MCBS shall be tested in accordance with MIL-STD-810, method 501.2, procedure II to verify conformance to 3.6. The M1 MCBS shall be lowered and raised three times. Failure of the M1 MCBS to lower/raise within the time limits specified in 3.10.1 shall constitute failure of the test.

4.7.7.2 Low temperature test. The M1 MCBS shall be tested in accordance with MIL-STD-810, method 502.2, Procedure I. The Ml MCBS shall then be lowered and raised. Failure of the Ml MCBS to lower and raise in accordance with 3.10.1 will constitute failure of the test.

4.7.8 Reliability test. To determine conformance to 3.12 the M1 MCBS shall be subjected to 22 breaching missions at combat load. The breaching missions shall be conducted in accordance with table IV. At least two minefields must be breached during each mission. Each minefield shall consist of at least 50 mines. At the end of each mission, the following sequence of tests shall be performed.

a. Inspect all external components for cracks, tears, and physical damage.
b. Check for loose or missing parts.
c. Check travel look mechanism and lifting mechanisms.
d. Adjust the skidshoes to the required plowing depth.
e. Lubricate if needed.

TABLE IV. Mission Profile.

Mode	Distance miles (meters)	Speed mph (kph)
1. Plows*	.186 (300)	3-10 (5-16)
2. Travel to next minefield belt (various terrain)	.124 (200)	10-45 (16-72)
3. Plow*	.186 (300)	3-10 (5-16)
4. Travel to minor minefield belt (various terrain)	.124 (200)	10-45 (16-72)
5. Plow*	.186 (300)	3-10 (5-16)
6. Travel to second minefield (45% roads, 551% cross country)	4.588 (7400)	10-45 (16-72)
7. Plow*	.186 (300)	3-10 (5-16)
8. Travel to next minefield belt (various terrain)	.124 (200)	10-45 (16-72)
9. Plow*	.186 (300)	3-10 (5-16)
10. Travel to next minefield belt (various terrain)	.124 (200)	10-45 (16-72)
11. Plow*	.186 (300)	3-10 (5-16)

The plowing courses shall be comprised of different soil types and plowing depths to determine conformance to 3.12. A minimum cumulative total of 160 hours is required; 2 systems for 80 hours each.

4.7.9 Maintainability test. To determine conformance to 3.13, the time to repair each incident shall be recorded, (see 6.4).

4.7.10 Fording test. To determine conformance to 3.12 the M1 MCBS shall be forded in water up to 48 in. (121 cm) deep. After fording the M1 MCBS shall be inspected for damage and operated several times to ensure the blades work after going thru water.

4.7.11 Rain test. These tests shall be conducted in accordance with MIL-STD-810, method 506.2, procedure III.

4.7.12 Lubricant inspection. To determine conformance to 3.14 the electromechanical motors shall be inspected for oil leakage and proper lubrication.

4.7.13 Surface finish inspection. To determine conformance to 3.15 the contractor shall, after the complete paint finish has been applied and cured, inspect, for workmanship, total paint film thickness (4.7.13.1) and paint adhesion. The use of test panels in lieu of actual production is prohibited. The paint adhesion test will be conducted by means of the scribe tape test (see 4.7.13.2). Two locations on each sample unit shall be selected to conduct the test. The test locations shall be routinely varied among the following:

a. Directly adjacent to a weld.
b. On or directly adjacent to a machine cut or sheared edge.
c. Any mechanically formed surface where lubricants were used.
d. Paint touch-up areas.

The precise location for the scribe test shall be in an obscure location and be acceptable to the cognizant Government quality assurance representative. Upon completion of the scribe test, the scribe marks shall be feathered into the adjacent area and touched up with the required tap coat. Painting procedures shall be verified to ensure the requirements of MIL-STD-193 are adhered to. The contractor shall have at least a quart sample of each production lot of MIL-C-46168 or MIL-C-53039 paint validated for spectral reflectance characteristics in accordance with 4.2.4 of MIL-C-46168 or MIL-C-53039.

4.7.13.1 Film thickness test. Film thickness shall be verified with a non-destructive film gauge. The gauge shall be suitable for measurements over the applicable substrate material and shall have sufficient accuracy to assure compliance to the thickness limitations specified. The gauge shall be capable of being calibrated to known standards. Wet film shall be checked with a wet film gauge. Five locations on each sample shall be tested. Four of the applicable surface points tested on each unit shall meet the stated requirements. Failure of test shall result in rejection of the M1 MCBS.

4.7.13.2 Scribe test. The following test procedure shall be followed:

a. Scribe four (4) one-inch lines completely through the paint finish, one eighth inch apart.
b. Scribe another four (4) one-inch, one-eighth inch apart, ninety (90) degrees to the first set of lines. The resulting pattern shall be nine, one-eighth inch squares.
c. Press a length of A-A-1830, A-A-884 or any commercially available tape with a minimum adhesion rating of 45 oz. per inch of width firmly over the scribed pattern, rubbing out all air pockets.

d. Wait ten seconds minimum. Grasp a free end of the tape and at a rapid speed strip it from the painted surface by pulling the tape back upon itself at 180 degrees.

The removal of two or more squares of top coat, top coat primer or top coat primer pre-treatment coating on either test surface constitute test failure and the Ml MCBS is rejected. Removal of over spray does riot constitute test failure.

4.8 Inspection of packaging.

4.8.1 Quality conformance inspection of packaging.

4.8.1.1 Unit of product. For the purpose of inspection, a completed pack prepared for shipment shall be considered a unit of product.

4.8.1.2 Level of inspection. Each mine clearing blade shall be examined for the following defects. AQL shall be 1.0 percent defective.

122. Preservation not as specified for level A or level C, (see 5.1).
123. Packing not as specified for level A or level C, (see 5.2).
124. Marking incorrect, illegible or missing, (see 5.3).

4.9 Transportability test.

4.9.1 Tiedown provisions. The tiedown provisions shall be tested in accordance with MIL-STD-209 to prove conformance to 3.19.1. Inability to meet the requirements of 3.19.1 shall constitute failure of this demonstration.

4.9.2 Slinging provisions. The slinging provisions shall be tested in accordance with MIL-STD-209 to prove conformance to 3.19.2. Inability to meet the requirements of 3.19.2 shall constitute failure of this demonstration.

4.9.3 Rail impact test. The first article mine clearing blade shall be tested in accordance with the following rail impact test procedure.

Step 1. From one to five railcars shall be positioned on a level section of track. The following conditions shall be satisfied:

a. The total weight of the car(s) shall be at least 250,000 pounds (114, 00 hg).
b. The couplers between any cars shall be compressed to take up any slack.
c. All of the air and hand brakes on the car(s) used shall be set.
d. Any load in or on the car(s) shall be secured to prevent sliding or shifting; any movement greater than 1.97 inches (5 centimeters) shall be justification for retest.
e. The end of the buffer car to be struck must have a standard draft gear.

Step 2. Mount the test item on the test car. The test car shall be equipped with standard draft gears and conventional under frames. Mounting of the test item shall incorporate the standard loading and bracing method as shown in section 6 of the Association of American Railroads (AAR) "Rules Governing the Loading of Department of Defense Materiel on the Open Top Cars." No exotic or unusual tiedown methods shall be used; any non-standard loading and bracing must be approved by the Military Traffic

Management Command Transportation Engineering Agency (MTMCTEA), ATTN: MIT-TR, P. 0. Box 6276, Newport News, VA 23606-0276 prior to testing. The arrangement of the test item and its blocking and tiedown to be tested shall be identical to that proposed and approved by M1MCTEA (if nonstandard).

Step 3. Situate the test car between the buffer cars and the locomotive, pull the test car at least 200 feet (65 meters) from the buffer car(s) along a level section of track (a minimum distance to achieve the required locomotive speeds).

Step 4. Position the knuckles of the buffer and test cars for coupling.

Step 5. Install a timing device to measure the test car speed (+ or - .1 km/hr) just prior to impact with the buffer car(s). Suggested methods include electronic timing (microswitches) and radar. The use of torpedoes and a stopwatch is permissible but not recommended because of the inaccuracies involved.

Step 6. Push the test car towards the buffer car(s) and, by using the locomotive's speedometer or other ream, release the test car when the desired test speed is reached, thus allowing the test car to freely impact the buffer car(s).

Step 7. Repeat step 6 until the test car(s) has impacted the buffer car three tires at the same end, once each at speed of 4, 6, and 8 mph, (6.4, 9.7 and 13 km/hr) to +0.5 mph (0.8 km/hr) or -0.0 mph (0.0 km/hr). Reverse the test car and repeat the 8 mph (13. 0 km/hr) for a total of 4 impacts.

Note: Adjustment of the lading or securing mechanism or reconditioning of the bracing or items of is not allowed without a complete retest.

4.9.4 Failure criteria. Failure to meet the requirements of 3.19.4 and 4.9.3 rail impact test shall constitute failure of this test.

5. PACKAGING

5.1 Preservation. Preservation shall be level A or C (see 6.2).

5.1.1 Level A. Unpainted or otherwise unprotected surfaces of the M1 MCBS and accessory equipment susceptible to corrosion shall be coated with a preservative in accordance with MIL-P-116. When removal of the preservative can be accomplished without damage to the item or where removal of the preservative is not required, these surfaces shall be coated with P-1 preservative. Surfaces not suitable for coating with P-1 preservative and all machined surfaces shall be coated with P-11 preservative. Machine surfaces shall be wrapped with a barrier material conforming with MIL-B-121, grade A, and secured with tape conforming to PPP-T-60, type IV.

5.1.2 Level C. The Ml MCBS and accessory equipment shall be preserved in accordance with, MIL-P-116, method III.

5.2 Packing. Packing shall be level A or C (see 6.2).

5.2.1 Level A. The M1 MCBS and accessory equipment preserved as specified in 5.1.1 shall be packed in one or more crates conforming to MIL-C-104, type II, class 2, style a. The exterior size of any one crate shall not exceed 18.5 feet (5.63 meter) long by 7 feet (2.13 rater) wide by 6.5 feet (1.98 meter) high. Accessory equipment and any loose parts shall be packed in box(es) conforming to PPP-B-601, overseas type or PPP-B-621, class 2. The Ml MCBS and box(es) housing accessory equipment and loose parts shall be anchored, blocked and braded on the crate base in accordance with MIL-STD-1186.

5.2.2 Level C. The M1 MCBS and accessory equipment preserved as specified in 5.1.2 shall be packed as specified for level A except that the accessory equipment and any loose parts shall be packed in box(es) conforming to PPP-B-601, domestic type or PPP-B-621, class 1.

5.3 Marking. In addition to any special marking specified in the contract or purchase order (see 6.2), marking shall be in accordance with MIL-STD-129.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The M1 MCBS is intended for use with the Ml series main battle tank for extracting or removing any land mines or booby traps from the Ml series MBT path and to detonate tilt-rod type mines in front of tract of the Ml series MBT.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number and date of this specification.
b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
c. When a first article is required for inspection and approval, and the number of units required (see 3.3).
d. Terrain and climatic test requirements (see 4.7.7).
e. Color when other than specified (see 3.15).
f. Level of preservation and packing required (see 5.1 and 5.2).
g. Any special parking (see 5.3).

6.3 First article. When a first article inspection is required, the items should be an initial production item. The first article should consist of two units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, tests, and approval of the first article test results and disposition of the first article.

6.4 Definitions.

Leaks

(1) Class I. Seepage of fluid (as indicated by wetness or discoloration) not enough to form drops.

(3) Class II. Leakage of fluids great enough to form drops that fall from. the item being checked/inspected.

(2) Class III. Leakage of fluids great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

Incident

An incident is defined as an occurrence or detection of any actual, intermittent or incipient malfunction, safety hazard or degradation in the performance of the M1 MCBS. An incident is any event, regardless of its apparent importance or unimportance, that is cut of the ordinary, unexpected or other than required for the M1 MCBS.

6.5 Subject term (key word) listing.

Blade
Blade, mine clearing
Blade, mine clearing M1
Mine clearing blade system

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the charges.

Custodian:
Army – ME

Review activities:
Navy - MC
DLA - CS

Preparing Activity:
Army - ME

Project 2590-A013