

NOT MEASUREMENT SENSITIVENOTICE OF  
CHANGEMIL-STD-1949A  
NOTICE 1  
5 January 1990MILITARY STANDARD  
INSPECTION, MAGNETIC PARTICLE

TO ALL HOLDERS OF MIL-STD-1949A:

1. THE FOLLOWING PAGES OF MIL-STD-1949A HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
2	5 January 1990	2	15 May 1989
6	5 January 1990	6	15 May 1989
21	5 January 1990	21	15 May 1989

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-1949A will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or cancelled.

## Custodians:

Army - MR  
Navy - AS  
Air Force - 11

## Preparing Activity:

Army - MR  
Project NDTI-0180

## Review activities:

Army - AR, AV, EA, MI  
Navy - SH  
Air Force - 99, 70, 80, 82, 24, 84

## User activities:

Army - AT, AL, ME, TE, AR  
Navy - OS  
Air Force - 71

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AMSC N/A

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## 2. REFERENCE 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.

## SPECIFICATIONS

## MILITARY

MIL-I-83387 - Inspection Process, Magnetic Rubber  
 DOD-F-87935 - Fluid, Magnetic Particle Inspection, Suspension (Metric)

## STANDARDS

## FEDERAL

FED-STD-313 - Material Safety Data Sheets Preparation and the Submission of  
 FED-STD-595 - Colors

## MILITARY

MIL-STD-1907 - Inspection, Liquid Penetrant and Magnetic Particle Soundness Requirements For Materials, Parts and Weldments  
 MIL-STD-410 - Nondestructive Testing Personnel Qualification and Certification  
 MIL-STD-2175 - Castings, Classification and Inspection of  
 MIL-STD-45662 - Calibration Systems Requirements

(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.)

2.1.2 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.

29CFR 1910.1200 - Hazard Communication (OSHA)

Code of Federal Regulations is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402

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## 4. GENERAL REQUIREMENTS

4.1 Principles of magnetic particle inspection.

4.1.1 Intended use of magnetic particle inspection. The magnetic particle inspection method is used to detect cracks, laps, seams, inclusions, and other surface or slightly subsurface discontinuities in ferromagnetic materials. Magnetic particle inspection may be applied to raw material, billets, finished and semifinished materials, welds, and in-service parts. Magnetic particle inspection is not applicable to nonferromagnetic metals and alloys such as austenitic stainless steels.

4.1.2 Basic principle. The method is based on the principle that the magnetic flux near the surface of a magnetized material is distorted locally by the presence of discontinuities. This distortion of the field pattern, termed "flux leakage", is capable of attracting and holding an inspection medium of finely divided magnetic particles. The resulting accumulation of particles will be visible under the proper lighting conditions. Sensitivity is greatest for discontinuities at the surface.

4.1.3 Magnetization and particle application. Magnetic particle inspection consists of magnetization of the area to be inspected, application of suitably prepared magnetic particles while the area is magnetized or being magnetized, and subsequent classification, interpretation, and evaluation of any resulting particle accumulations. Maximum detectability occurs when the discontinuity has a depth at least five times its opening, a length at least equal to its depth, and is positioned perpendicular to the magnetic flux. In order to detect discontinuities in all directions at least two magnetic fields, perpendicular to one another in a plane parallel to the surface being inspected shall be used, except when specifically exempted by the contracting agency.

4.2 Qualification of inspection personnel. All personnel performing magnetic particle inspection shall be qualified and certified in accordance with MIL-STD-410. Personnel making accept/reject decisions in accordance with the process described by this standard shall be qualified to at least a level II per MIL-STD-410. Personnel performing the processing steps described in this standard shall be qualified to at least a level I per MIL-STD-410.

4.3 Acceptance requirements. The acceptance requirements applicable to the part or group of parts shall be incorporated as part of a written procedure either specifically or by reference to other applicable documents such as MIL-STD-1907 containing the necessary information. Applicable drawings or other documents shall specify the acceptable size and concentration of discontinuities for the component, with zoning of unique areas as required by design requirements. These acceptance requirements shall be as approved or as specified by the contracting agency.

4.4 Written procedure. Magnetic particle inspection shall be performed in accordance with a written procedure applicable to the parts or group of parts under test. The procedure shall be in accordance with the requirements and guidelines of this standard. The procedure shall be capable of detecting the smallest rejectable discontinuities specified in the acceptance

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Methods for establishing requirements for steel forgings are discussed in ASTM A275. Methods for classifying metal castings are given in MIL-STD-2175. MIL-STD-1907 provides a classification scheme for ferromagnetic forgings, castings, extrusions and weldments.

5.12 Safety. Safe handling of magnetic particles (wet or dry), oil vehicles water baths, and water conditioner concentrates are governed by the suppliers' Material Safety Data Sheets (MSDS). Material Safety Data Sheets, conforming to 29 CFR 1910.1200, or equivalent, must be provided by the supplier to any user and shall be prepared in accordance with FED-STD-313.

5.12.1 Flammability. Flash point of oil vehicles shall be in accordance with AMS 2641 or DOD-F-87935. The suppliers' MSDS shall certify the flash point.

5.12.2 Personnel hazards. Precautions against inhalation, skin contact, and eye exposure are detailed in the suppliers' MSDS. These precautions shall be observed.

5.12.3 Electrical hazards. Magnetizing equipment shall be properly maintained to avoid personnel hazards from electrical short circuits. Care must be taken to reduce arcing and possible ignition of oil baths.

5.12.4 Black light. It is recommended that the intensity of black light incident on unprotected skin or eyes not exceed 1000 W/cm<sup>2</sup>. Cracked or broken UV filters shall be immediately replaced. Broken bulbs can continue to radiate UV energy and must be replaced immediately. Spectacles designed to absorb UV wavelength radiation are suggested for close, high black light intensity inspection.

5.13 Dark adaptation. Personnel must wait at least one minute after entering a darkened area for their eyes to adjust to the low level lighting before performing fluorescent magnetic particle inspection.