



## Standard Practice for Liquid Penetrant Testing<sup>1</sup>

This standard is issued under the fixed designation E1417/E1417M; the number immediately following the designation indicates the year of original adoption or, in the case of revisions, the year of last revision. A number in parentheses indicates the year of last approval. A superscript symbol (°) indicates an editorial change since the last revision or approval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

### 1. Scope<sup>2</sup>

1.1 This practice establishes the minimum requirements for conducting liquid penetrant examination of nonporous metal and nonmetal components.

**Note 1**—This practice replaces MIL-STD-1516.

1.2 The penetrant examination processes described in this practice are applicable to in-process, final, and maintenance (in-service) examinations. These processes are applicable for the detection of discontinuities, such as lack of fusion, corrosion, cracks, laps, cold shuts, and porosity, that are open or connected to the surface of the component under examination.

1.3 Caution must be exercised in the usage of elevated temperature with components manufactured from thermoplastic materials. Also, some cleaners, penetrants, and developers can have a deleterious effect on nonmetallic materials such as plastics. Prior to examination, tests should be conducted to ensure that none of the cleaning or examination materials are harmful to the components to be examined.

1.4 **Units**—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 All areas of this practice may be open to agreement between the cognizant engineering organization and the supplier, or specific direction from the cognizant engineering organization.

1.6 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

### 2. Referenced Documents

2.1 The following documents form a part of this practice to the extent specified herein:

#### 2.2 ASTM Standards<sup>3</sup>

**D95** Test Method for Water in Petroleum Products and Bituminous Materials by Distillation

**D2512** Test Method for Compatibility of Materials with Liquid Oxygen (Impact Sensitivity Threshold and Pass-Fail Techniques)

**D6304** Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration

**E165** Practice for Liquid Penetrant Examination for General Industry

**E543** Specification for Agencies Performing Nondestructive Testing

**E1135** Test Method for Comparing the Brightness of Fluorescent Penetrants

**E1316** Terminology for Nondestructive Examinations

**E2297** Guide for Use of UV-A and Visible Light Sources and Meters used in the Liquid Penetrant and Magnetic Particle Methods

**E3022** Practice for Measurement of Emission Characteristics and Requirements for LED UV-A Lamps Used in Fluorescent Penetrant and Magnetic Particle Testing

#### 2.3 ASNT Standards<sup>4</sup>

**ANSI/ASNT-CP-189** Standard for Qualification and Certification of Nondestructive Testing Personnel

**SNT-TC-1A** Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

<sup>1</sup>This practice is under the jurisdiction of ASTM Committee E37 on Nondestructive Testing and is the direct responsibility of Subcommittee E37.01 on Liquid Penetrant and Magnetic Particle Methods.

Current edition approved June 15, 2016. Published July 2016. Originally approved in 1999. Last previous edition approved in 2003 as E1417/E1417M – 03. DOI: 10.1520/E1417-1417M-16.

<sup>2</sup>The referenced ASTM standards, and the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup>Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28868, 1715 Jefferson La., Columbus, OH 43228-0868, <http://www.asnt.org>.

<sup>4</sup>A Summary of Changes section appears at the end of this standard.

# Astm E 1417

**American Society for Testing and  
Materials**

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*Nondestructive Evaluation* Peter J. Shull, 2002-05-08 Describing NDE issues associated with real world applications this comprehensive book details conventional and forthcoming NDE technologies It instructs on current practices common techniques and equipment applications and the potentials and limitations of current NDE methods Each chapter details a different method providing an overview an e *Manuals Combined: Nondestructive Testing (NDT) And Inspection (NDI)* , Over 8 300 pages Just a SAMPLE of the CONTENTS NONDESTRUCTIVE INSPECTION METHODS Published by the Departments of the Army Navy and Air Force on 1 March 2000 771 pages and June 2005 762 pages Metallic Materials and Elements for Aerospace Vehicle Structures 1 733 pages Designing and Developing Maintainable Products and Systems Revision A 719 pages Sampling Procedures and Tables for Inspection by Attributes 75 pages Nondestructive Testing Acceptance Criteria 88 pages Environmental Stress Screening Process for Electronic Equipment 49 pages Handbook for Reliability Test Methods Plans and Environments for Engineering Development Qualification and Production Revision A 411 pages Human Engineering Revision F 219 pages Sampling Procedures and Tables for Life and Reliability Testing Based on Exponential Distribution 77 pages Test Method Standard Electronic and Electrical Component Parts 191 pages Reliability Testing for Engineering Development Qualification and Production Revision D 47 pages Electroexplosive Subsystem Safety Requirements and Test Methods for Space Systems 150 pages 8 64 MB Reliability Prediction of Electronic Equipment Notice F 205 pages Reliability Program for Systems and Equipment Development and Production Revision B 88 pages Electronic Discharge Control Handbook for Protection of Electrical and Electronic Parts Assemblies and Equipment Excluding Electrically Initiated Explosive Devices Revision B 171 pages Electrical Grounding for Aircraft Safety 290 pages Fuze and Fuze Components Environmental and Performance Tests for Revision C 295 pages Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment Revision E 253 pages Maintainability Verification Demonstration Evaluation Revision A 64 pages Failure Rate Sampling Plans and Procedures Revision C 41 pages Maintainability Prediction 176 pages Definition of Terms for Reliability and Maintainability Revision C 18 pages Semiconductor Devices 730 pages Reliability Modeling and Prediction Revision B 85 pages Established Reliability and High Reliability Qualified Products List QPL Systems For Electrical Electronic and Fiber Optic Parts Specifications Revision F 17 pages Environmental Test Methods and Engineering Guidelines 416 pages Test Methods for Electrical Connectors Revision A 129 pages Environmental Engineering Considerations and Laboratory Tests Revision F 539 pages System Safety Program Requirements 117 pages Test Method Standard Microcircuits Revision E 705 pages Test Method Standard Microcircuits Revision F 708 pages Procedures for Performing a Failure Mode Effects and Criticality Analysis Revision A 54 pages *Piping and Pipeline Engineering* George A. Antaki, 2003-05-28 Taking a big picture approach Piping and Pipeline Engineering Design Construction Maintenance Integrity and Repair elucidates the fundamental steps to any successful

pipng and pipeline engineering project whether it is routine maintenance or a new multi million dollar project The author explores the qualitative details calculations and t **Aircraft Inspection and Repair** Federal Aviation Administration,2010-01-01 With every deadly airplane disaster or near miss it becomes more and more clear that proper inspection and repair of all aircraft is essential to safety in the air When no manufacturer repair or maintenance instructions are available the Federal Aviation Administration deems Aircraft Inspection and Repair the one stop guide to all elements of maintenance preventive rebuilding and alteration With detailed information on structural inspection protection and repair including aircraft systems hardware fuel and engines and electrical systems this comprehensive guide is designed to leave no vital question on inspection and repair unanswered Sections include Wood fabric plastic and metal structures Testing of metals and repair procedures Welding and brazing including fire explosion and safety Nondestructive inspection NDI Application of magnetic particles Common corrosive elements and corrosion proofing Aircraft hardware from nuts and bolts to washers and pins Engines fuel exhaust and propellers Aircraft systems and components Electrical systems This is a book that should be available to everyone who works on aircraft or is training to do so The official FAA guide to maintenance methods techniques and practices essential for all pilots and aircraft maintenance workers 200 B W 200 B W **The AS9100C, AS9110, and AS9120 Handbook** James Culliton,2014-04-18 AS9100 AS9110 and AS9120 the quality management system QMS standards for the aerospace industry are written in the most ambiguous language possible Indeed they don t outline how they should be implemented Those decisions are left to the organization implementing their requirements or in some cases to a consultant Although some consultant firms for aerospace systems are excellent there are many that purport to be experts yet proffer systems and processes that are either in contravention to the standards requirements or so unwieldy that they render the process impotent In an effort to simplify these issues this book proposes practices that have been described as opportunities for improvement or best practices by registration auditors in the past It includes a discussion of each of the three standards clauses suggests best practices to comply with them outlines common findings associated with them and provides an overview of the changes to AS9100C from AS9100B *Annual Book of ASTM Standards* ASTM International,American Society for Testing and Materials,2003 **Make it Safe!** Peter Tomter Pedersen,2008-06-28 The primary target is the A P mechanic who wants to learn what information he she needs to know seek according to service on a Cessna 172 the secondary target is owners who want to do service according to Preventive maintenance FAR 43 Appendix A or Limited Pilot Owner Maintenance EASA No 2042 2003 PART M Appendix VIII *Materials Evaluation* ,2006 Federal Register ,1999-10-06 **ASTM Special Technical Publication** ,1961 **Industrial Radiography and Non-destructive Testing** ,1997 **Standardization News** American Society for Testing and Materials,2000 **SAE AMS Index** Society of Automotive Engineers. Cooperative Engineering Program,2008 Annual Book of ASTM Standards American Society for Testing and Materials,2007 **California Natural Gas Pipeline**

**Assessment** Andrew Hammerschmidt, Gas Technology Institute, 2013      **Review of Progress in Quantitative**  
**Nondestructive Evaluation** Donald O. Thompson, Dale E. Chimenti, 2003-04-04 The papers in this proceedings volume were peer reviewed before acceptance The Review of Progress in Quantitative NDE has established itself as the world's leading forum for the presentation of research and early engineering demonstrations in quantitative nondestructive evaluation It is international in scope and broadly interdisciplinary in content covering recent developments in measuring techniques ultrasonics electromagnetics x rays thermal acoustic emission etc and their applications to materials characterization and structural integrity      ACI Manual of Concrete Practice ,1998      *Thomas Register of American Manufacturers* ,2002 This basic source for identification of U S manufacturers is arranged by product in a large multi volume set Includes Products services Company profiles and Catalog file      **Applied Science & Technology Index** ,2000      **Metals--Mechanical Testing** American Society for Testing & Materials, 2004-04 This work contains approved ASTM standards provisional standards and related material including classifications guides specifications and glossaries for mechanical testing elevated and low temperature tests and metallography Coverage includes crack growth behavior cyclic deformation and fatigue crack formation calibration of mechanical

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