



WIPING MATTERS? LOW-LINT VS LINT-FREE

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DAVID MA
MATERIAL AND PROCESS ENGINEERING
DELTA AIR LINES

WIPING MATTERS? LOW-LINT VS LINT-FREE



WHAT'S THE
PROBLEM
WITH LINT?



WIPE
LABELING



FPI LINT
REQUIREMENTS



LINT
SPECIFICATIONS



HOW MUCH
LINT IS
ACCEPTABLE?

WHAT'S THE
PROBLEM WITH
LINT?

LINT

What Defines “No-Lint” or “Low-Lint”?

How Much Lint is Acceptable in an FPI Wipe?

How Should Lint be Specified for Inspection?



WIPES

KIMTECH SCIENCE DELICATE TASK KIMWIPES



KIMTECH SCIENCE Delicate Task Kimwipes are advertised as “Extra Low-Lint”, but do not note any specification approvals to support that claim.

KIMTECH P2 AVIATION SURFACE PREPARATION



KIMTECH P2 AVIATION SURFACE PREPARATION WIPES
Clearly Cite Conformance with AMS 3819, which quantitatively affirms a Low-Lint Condition.





- Single ply, light-duty wiper that can handle a variety of delicate tasks
- Extra low-lint wipers made from 100% virgin wood fibers
- Soft, nonabrasive cellulose fiber wipers won't scratch most delicate surfaces
- Easily wipe up liquid and dust
- Absorb many times their own weight
- Handy one-at-a-time dispensing packs with special plastic guard to reduce airborne lint, keep contaminants out of box and reduce electrostatic discharge

Specifications

Product Type	KimWipes™ Delicate Task Wipers	Material	Cellulose
Color	White	Disposable	Yes
For Use With (Application)	General-Purpose	Ply	1-ply

Fisher Scientific

<https://www.fishersci.com/shop/products/kimberly-clark-kimtech-science-kimwipes-delicate-task-wipers-7/p-211240>



Cellulose under microscope. Compared to the poly-cellulose blend ..., this substrate has many loose fibers. Clearly not a lint-free wipe.

Blue Thunder Technologies

<https://bluethundertechnologies.com/a-wipe-thats-entirely-lint-free/>

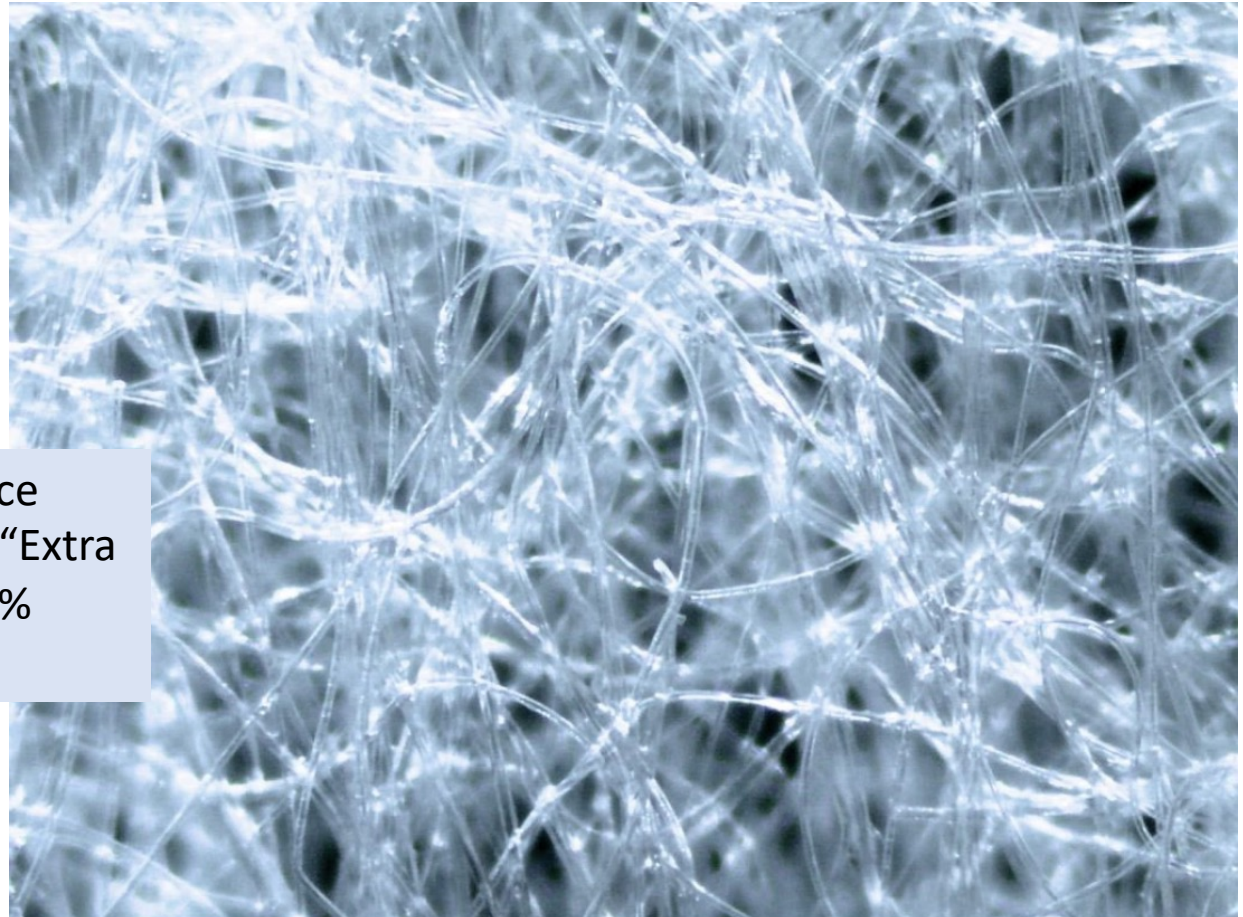
NOTE: IMAGE IS NOT OF KIMTECH SCIENCE DELICATE TASK – AND ONLY A MATERIAL REPRESENTATION



Remember, Kimtech Science Delicate Task is labeled as “Extra Low-Lint”, despite the 100% Cellulose Content

- Intuitive, alpha-numeric, performance-tier identification
- Compatible with solvents commonly used in the aviation as well as detergents, dilute acids and bases
- Low linting, silicone free and antistatic in use
- Made from a spunlace blend of cellulose and polyester fibres and contain no glues, adhesives or binders
- Delivered in a handy pop-up box for portability, that easily dispenses one wipe at a time
- Meet the requirements of Aerospace Material Specification (AMS) 3819C (Aerospace industry requirement) and Boeing Material Specification (BMS) 15-5F (Boeing)

Width (Metric)	30.48 cm	Width (English)	12 in.
Certifications/ Compliance	AMS 3819C, BMS 15-5F	Material	Polyester Cellulose
For Use With (Application)	Critical surface preparation tasks in the aviation industry	Color	White



Polyester/Cellulose blend under a microscope – Notice there a very few visible loose fibers splitting from the strands. Wipes featuring this composition would be considered virtually lint-free wipes.

Blue Thunder Technologies
<https://bluethundertechnologies.com/a-wipe-thats-entirely-lint-free/>

Fisher Scientific
<https://www.fishersci.com/shop/products/kimberly-clark-kimtech-science-kimwipes-delicate-task-wipers-7/p-211240>

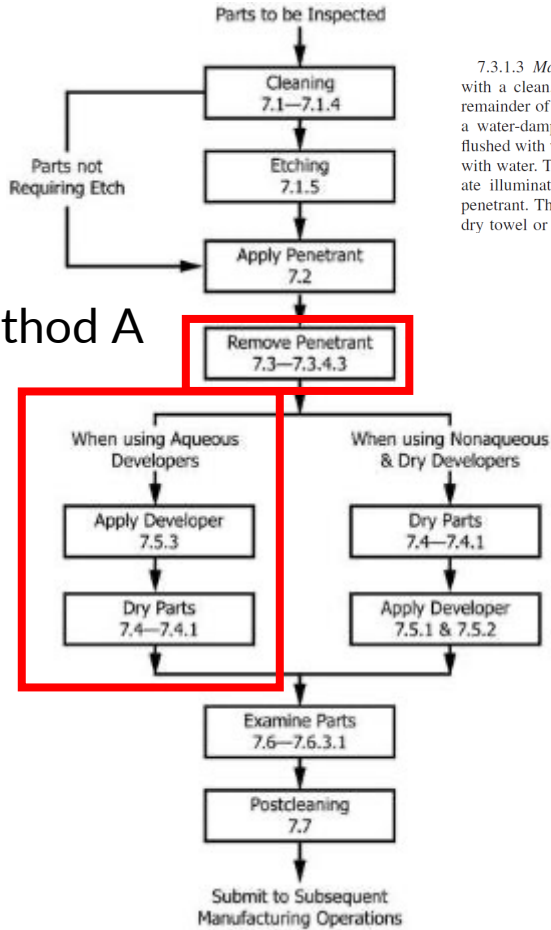
NOTE: IMAGE IS NOT OF KIMTECH P2 – AND ONLY A MATERIAL REPRESENTATION



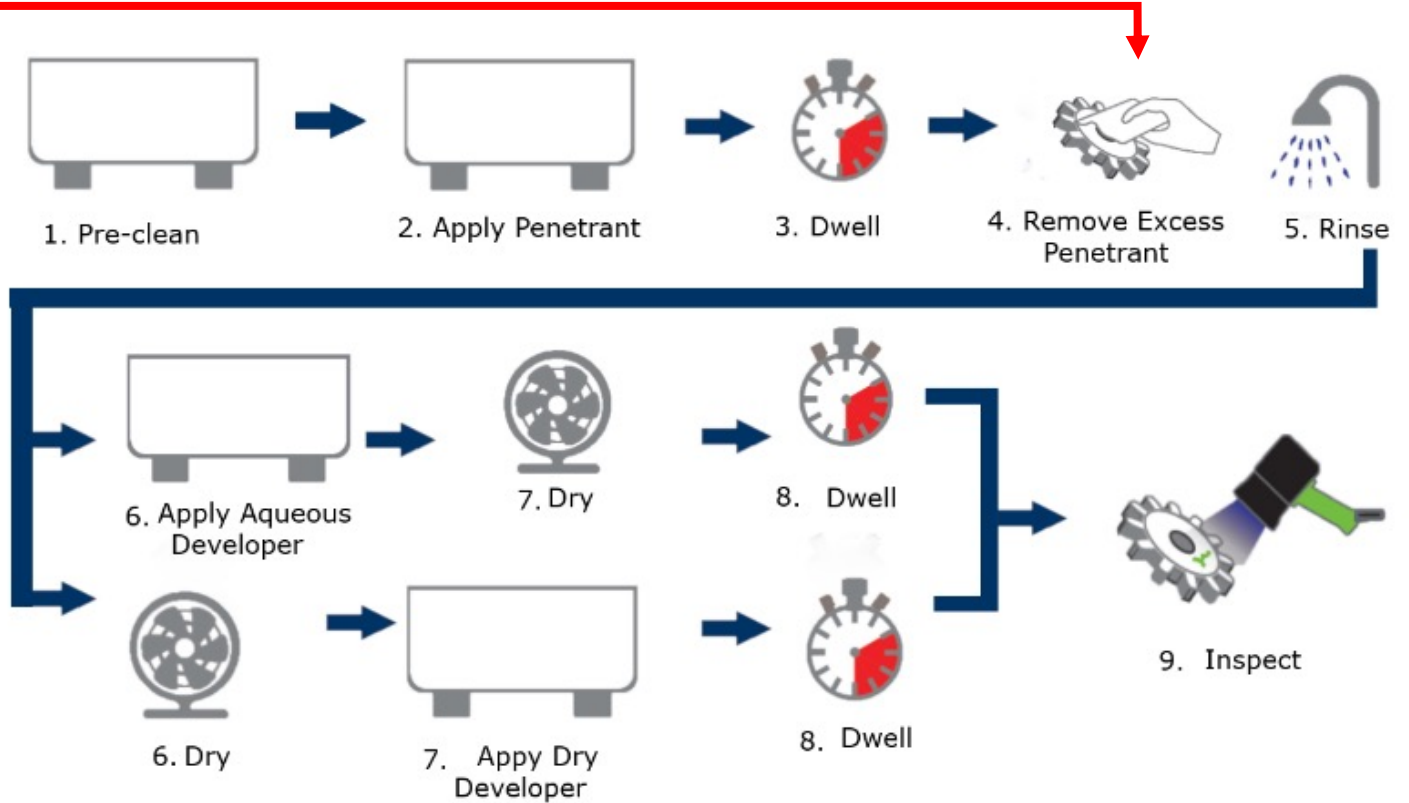
FPI

METHOD A: Water Wash Fluorescent

Method A



7.3.1.3 *Manual Wipe*—Excess penetrant shall be removed with a clean, dry, lint-free cloth or absorbent toweling. The remainder of the surface penetrant shall then be removed with a water-dampened cloth or towel. The surface shall not be flushed with water and the cloth or towel shall not be saturated with water. The component shall be examined under appropriate illumination to ensure adequate removal of the surface penetrant. The surface shall be dried by blotting with a clean, dry towel or cloth, or by evaporation.



ASTM E1417 AND AMS 2647 -
LINT REQUIREMENTS FOR
FPI

METHOD C: Solvent Removable (Local Application) FPI



AEROSPACE MATERIAL SPECIFICATION	AMS2647™	REV. G
	Issued 1985-04 Revised 2021-09 Superseding AMS2647F	

Fluorescent Penetrant Inspection
Aircraft Structures and Engine Component Maintenance

RATIONALE

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.



Designation: E1417/E1417M - 21¹

**Standard Practice for
Liquid Penetrant Testing¹**

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 revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

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

¹ NOTE—Table 1 was updated editorially in December 2021.

1. Scope*

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-6866.

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 are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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.

NOTE 2—Throughout this document, the term *blacklight* has been changed to *UV-A* to conform with the latest terminology in Terminology E1316. *Blacklight* can mean a broad range of ultraviolet radiation; fluorescent penetrant examination only uses the UV-A range.

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 appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

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

- 2.2 *ASTM Standards:*²
 - D95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation
 - D6304 Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration
 - E165/E165M Practice for Liquid Penetrant Testing for General Industry
 - E203 Test Method for Water Using Volumetric Karl Fischer Titration
 - 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

**BOTH ASTM 1417
AND SAE AMS 2647
INCLUDE A LINT-FREE
CLOTH MANDATE FOR
METHOD C LOCALLY
APPLIED SOLVENT
REMOVABLE FLUORESCENT
PENETRANT
INSPECTIONS.**

AMS2647F is a Five-
and definition for Me
aerospace hardware,
have been updated to
replacing "light meter"
consistent with AMS2

1. SCOPE

1.1 Purpose

This specification del
components during m

1.1.1 This specific
information co
either subject
specifically inv
or other contr
guidance and
included:

1.1.1.1 Appendix A

1.1.1.2 Appendix B

**1.1.1.3 Appendix C
Accessibility**

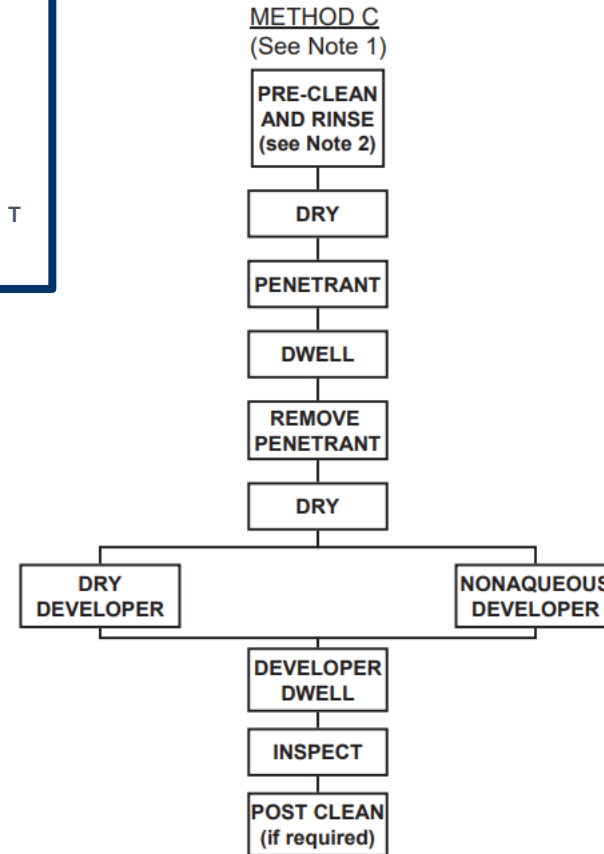
1.2 Processing of p
accomplished t
personnel shall

1.3 Basis of Applica

This process has been
associated accessor

SAE Executive Standards Com
entirely voluntary, and its applic
SAE reviews each technical re
suggestions.
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AMS 2647

**FIG. 3 Solvent removable
penetrant inspection process**



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METHOD C
(See Note 1)

PRE-CLEAN
AND RINSE
(see Note 2)

DRY

PENETRANT

DWELL

REMOVE
PENETRANT

DRY

DRY
DEVELOPER

NONAQUEOUS
DEVELOPER

DEVELOPER
DWELL

INSPECT

POST CLEAN
(if required)

METHOD C: Solvent Removable (Local Application) FPI



1. Pre-clean



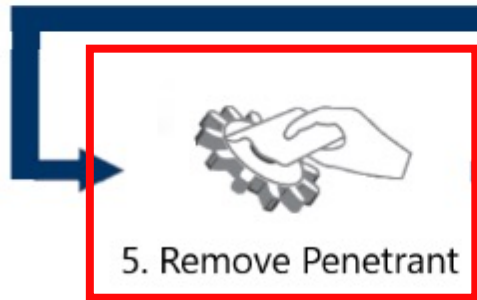
2. Apply Penetrant



3. Dwell



4. Remove Excess
Penetrant



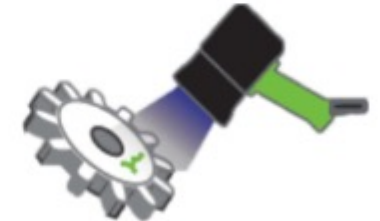
5. Remove Penetrant



6. Apply Developer



7. Dwell



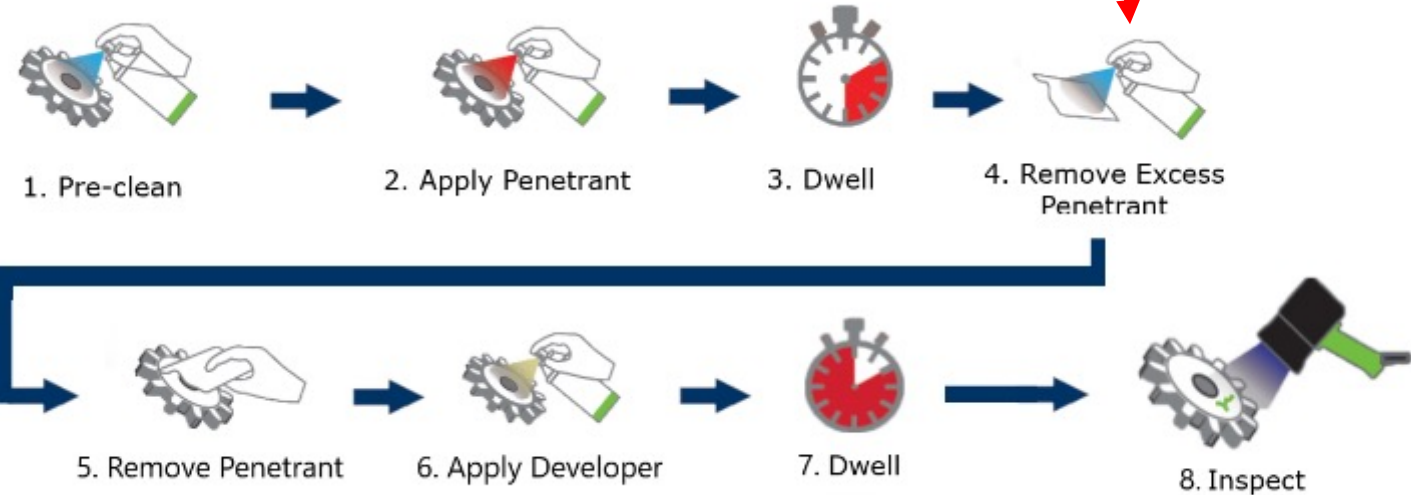
8. Inspect

FPI

METHOD C: Solvent Removable (Local Application) FPI

ASTM 1417

7.3.3 Method C Process—Solvent-removable penetrants are removed by first wiping the excess penetrant with a clean, lint-free, dry cloth or absorbent toweling. The remainder of the



SAE AMS 2647

3.4.6.1 Remove the excess penetrant by wiping with a clear, lint-free, dry cloth or absorbent toweling.



FPI

ASTM 1417

7.3.3 Method C Process—Solvent-removable penetrants are removed by first wiping the excess penetrant with a clean, lint-free, dry cloth or absorbent toweling. The remainder of the

lint-free, dry cloth or absorbent toweling. The remainder of the surface penetrant is then removed with a solvent-dampened lint-free cloth or towel. The surface of the component shall not be flushed with solvent, and the cloth or towel shall not be saturated with solvent. The component and cloth or toweling shall be observed under appropriate illumination to ensure adequate removal of the surface penetrant. Over-removal of the surface penetrant shall require the component to be cleaned and reprocessed. The surface shall be dried by blotting with a lint-free, dry cloth or towel, or by evaporation. Method C can also be used for water-washable penetrants using water or solvent for removal of excess penetrant.

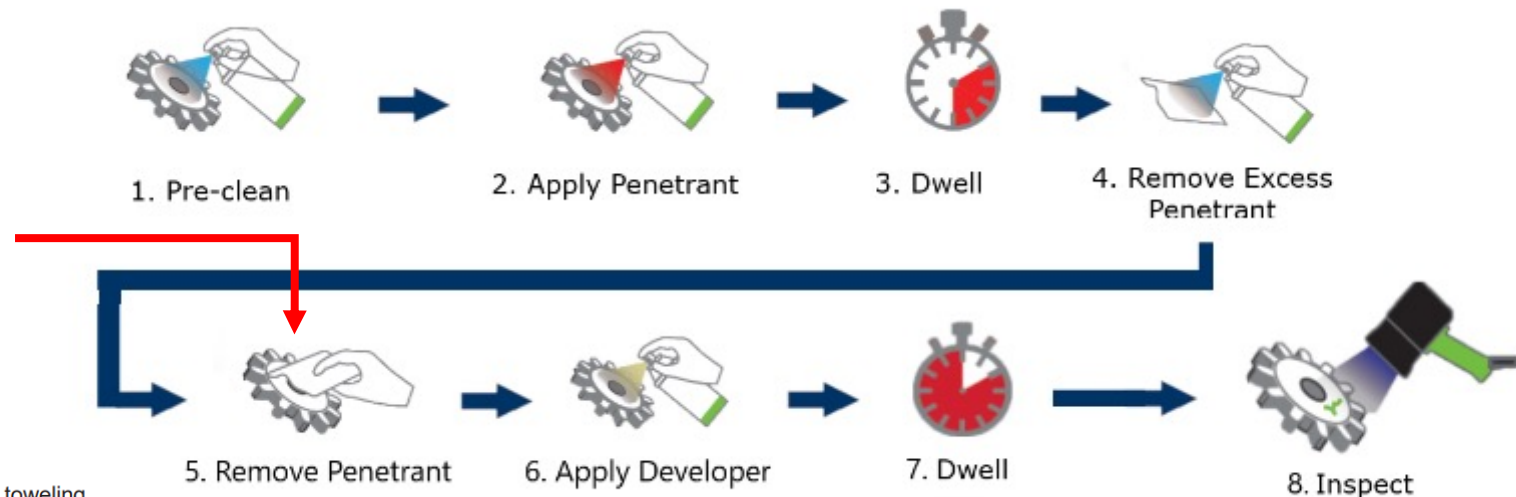
SAE AMS 2647

3.4.6.1 Remove the excess penetrant by wiping with a clean, lint-free, dry cloth or absorbent toweling.

3.4.6.2 Remove the remainder of the surface penetrant with a lint-free cloth or towel, dampened with a QPL-AMS-2644 approved solvent. Ensure that the surface of the part and/or the cloth or towel is not saturated with solvent. During the wiping, the part and cloth or towel shall be observed under appropriate UV-A irradiation to ensure adequate removal of surface penetrant. Excessive removal of the surface penetrant or flooding of the solvent on the surface of the part shall require the part to be cleaned, dried, and reprocessed.

3.4.6.3 The surface of the part shall be dried by wiping with a lint-free, dry cloth or towel or by evaporation. Ensure the surface is free of solvent residues before applying developer.

METHOD C: Solvent Removable (Local Application) FPI

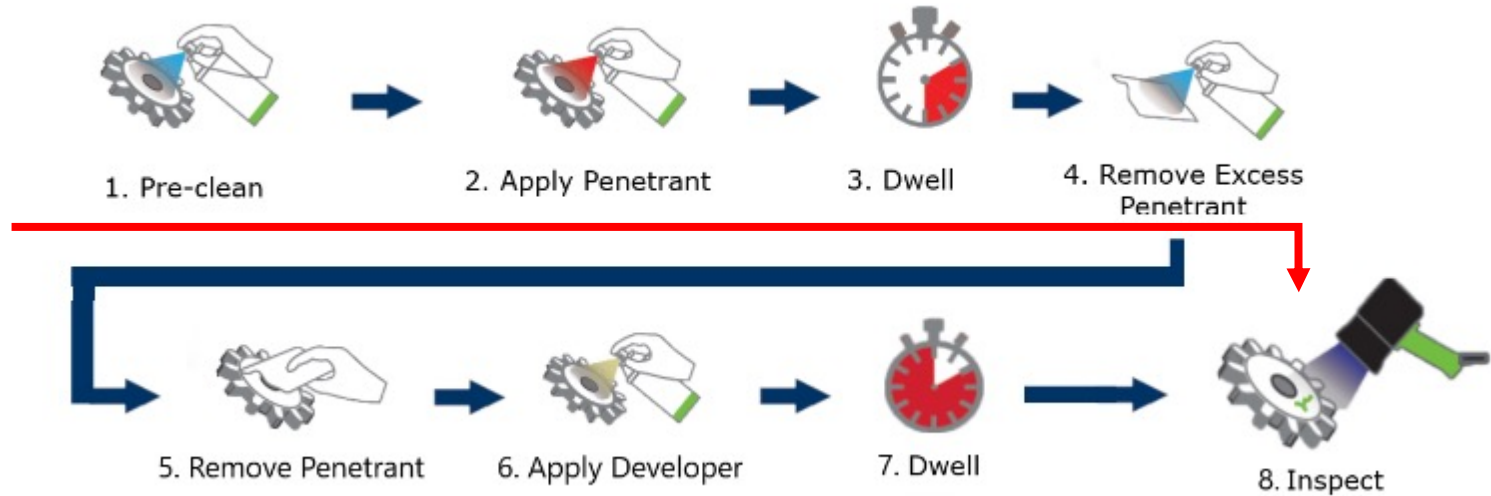


FPI

7.3.3 *Method C Process*—Solvent-removable penetrants are removed by first wiping the excess penetrant with a clean, lint-free, dry cloth or absorbent toweling. The remainder of the surface penetrant is then removed with a solvent-dampened lint-free cloth or towel. The surface of the component shall not be flushed with solvent, and the cloth or towel shall not be saturated with solvent. The component and cloth or toweling shall be observed under appropriate illumination to ensure adequate removal of the surface penetrant. Over-removal of the surface penetrant shall require the component to be cleaned and reprocessed. The surface shall be dried by blotting with a lint-free, dry cloth or towel, or by evaporation. Method C can also be used for water-washable penetrants using water or solvent for removal of excess penetrant.

7.6.3.1 *Indication Verification*—When addressed in the user's procedure, it is permissible to verify indications by wiping the indication with a solvent-dampened swab, brush, or lint-free cloth, avoiding flooding the area with solvent, allowing the area to dry, and redeveloping the area. Redevelopment time shall be a minimum of 10 min, except nonaqueous redevelopment time shall be a minimum of 3 min. If the indication does not reappear, the original indication may be considered false. This procedure may be performed up to two times for any given original indication. Unless otherwise specified, isopropyl alcohol, acetone, or QPL-AMS2644 approved solvents are permissible.

METHOD C: Solvent Removable (Local Application) FPI



LINT REQUIREMENTS IN
WIPE SPECIFICATIONS

INCH-POUND

MIL-DTL-24671C(SH)
 18 March 2002
 SUPERSEDING
 MIL-C-24671B(SH)
 31 July 1995

MILITARY SPECIFICATION

CLOTH, LINT-FREE, FLUSHING AND CLEANING

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers lint-free flushing and cleaning cloths with and without lanyards.

A - A - 5 9 3 2 3
 C L O T H S , C L E A N I N G ,
 L O W - L I N T

**LOW-
 LINT**

NO REQUIREMENTS/DEFINITION
 ON "LOW LINT"

NOTE: TYPE I OF THE SPEC IS
 STATED FOR CLEAN ROOM USE,
 "...LOW LINT WIPERS"



AEROSPACE MATERIAL SPECIFICATION	AMS3819™	REV. D
	Issued Revised	1987-07 2020-07
	Superseding AMS3819C	

(R) Cloths, Cleaning
 For Aircraft Primary and Secondary
 Structural Surfaces

RATIONALE

This specification is being revised to correct test methods, change the recertification period, and additional changes associated with the Five-Year Review.

1. SCOPE

1.1 Form

This specification covers woven, nonwoven, and knit absorbent materials supplied either as dry cloths or presaturated cloths for solvent cleaning process applications.

1.2 Application

These cloths have typically been used in cleaning metallic or nonmetallic aircraft surfaces preparatory to processing operations which are sensitive to residual surface contamination, but usage is not limited to such applications.

NOTE: The technical requirements listed in Section 3 may be insufficient to determine the compatibility between cloths and transparencies.

1.3 Classification

Cloths covered by this specification are classified as follows:

METRIC

A-A-59323A
 24 March 2005
 SUPERSEDING
 A-A-59323
 30 June 1999

COMMERCIAL ITEM DESCRIPTION

CLOTHS, CLEANING, LOW-LINT

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

1. SCOPE. This commercial item description (CID) covers the requirements for two low-lint type cleaning cloths.

2. CLASSIFICATION. The cleaning cloths shall conform to the following types:

- Type I - For clean room use – requiring ultra-clean, low lint wipers.
- Type II - For general use – requiring low-lint, highly absorbent wipers, but not clean room standards.

3. SALIENT CHARACTERISTICS.

3.1 Material. The cleaning cloths shall be of a knit construction consisting of virgin stretch-

M I L - D T L - 2 4 6 7 1
 C L O T H , L I N T - F R E E ,
 F L U S H I N G A N D C L E A N I N G

**LINT-
 FREE**

MIL-DTL-3819 REFERS TO "LINT-FREE" CLOTHS IN THE TITLE, BUT "LINT-FREE" REFERS ONLY TO THE CLOTH CONDITION TO THE NAKED EYE BEFORE WIPING THE SURFACE.

A M S 3 8 1 9
 C L O T H S , C L E A N I N G , F O R A I R C R A F T
 P R I M A R Y A N D S E C O N D A R Y
 S T R U C T U R A L S U R F A C E S

**LOW-
 LINT**

AMS 3819 GIVES A DETAILED INSTRUCTION
 TO ESTABLISH A QUANTITATIVE TEST
 DEFINING LOW-LINT.



INCH-POUND

MIL-DTL-24671C(SH)
18 March 2002
SUPERSEDING
MIL-C-24671B(SH)
31 July 1995

MILITARY SPECIFICATION

CLOTH, LINT-FREE, FLUSHING AND CLEANING

**MIL-DTL-24671
CLOTH, LINT-FREE,
FLUSHING AND CLEANING**

LINT-FREE

MIL-DTL-3819 REFERS TO "LINT-FREE" CLOTHS IN THE TITLE,
BUT "LINT-FREE" REFERS ONLY TO THE CLOTH CONDITION
TO THE NAKED EYE BEFORE WIPING THE SURFACE.

MIL-DTL-24671C(SH)

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1. SCO

1.1 Sc
without lanyar

1.2 Cla
specified (see

3.1.5 Lint and foreign material.

3.1.5.1 Grade 1. The cloth shall be free from loose thread, ravelings, lint and fluff from cloth or yarn or particles of a size visible to the unaided eye. The cloth shall also be free of any visible foreign particulate matter, dirt or grease either embedded in the cloth or adhering thereto.

3.1.5.2 Grade 2. The cloth shall be free from loose thread, ravelings, lint and fluff from cloth or yarn or loose particles of a size visible to the unaided eye. Each cloth may contain no more than five specks or stains of no visible thickness, and no speck or stain may exceed 1/16 inch in any dimension. Non-white threads woven into the fabric are acceptable.

3.1.6 Finish. The fabric shall be free of sizing and be bleached white.



A-A-59323
CLOTHS, CLEANING,
LOW-LINT

LOW-LINT



NO REQUIREMENTS/DEFINITION ON
"LOW LINT"

NOTE: TYPE I OF THE SPEC IS STATED
FOR CLEAN ROOM USE, "...LOW LINT
WIPERS"

METRIC

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SUPERSEDING
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3. SALIENT CHARACTERISTICS.





AEROSPACE MATERIAL SPECIFICATION

AMS3819™

REV. D

Issued 1987-07
Revised 2020-07

Superseding AMS3819C

(R) Cloths, Cleaning
For Aircraft Primary and Secondary
Structural Surfaces

AMS3819 CLOTHS, CLEANING, FOR AIRCRAFT PRIMARY AND SECONDARY STRUCTURAL SURFACES



LOW-LINT

3.7.3 Linting

Cloths shall lint not more than 10 mg/ft². For acceptance tests, linting shall be determined using the acceptance testing procedure described in 4.7.4 and 4.7.4.1, or the qualification testing procedure described in 4.7.4 and 4.7.4.2. For qualification tests, linting shall be determined using the qualification testing procedure described in 4.7.4 and 4.7.4.2.

AMS 3819 GIVES A DETAILED
INSTRUCTION TO ESTABLISH A
QUANTITATIVE TEST DEFINING
LOW-LINT.

4.7.4 Linting

Cloth linting shall be determined using the average weight of lint obtained from the testing of ten cloth samples. A new cloth shall be used for each of the ten weight determinations. Each sample to be tested shall be securely wrapped on a cylindrical

Weigh the aluminum foil and lint to the nearest 0.1 mg using the analytical balance. Calculate linting according to Equation 1:

$$\frac{144}{A} \times \frac{W_2 - W_1}{10} = \text{Linting in mg/square feet}$$

(Eq. 1)

where:

A = contact surface area of bar in square inches

W₁ = weight of aluminum foil

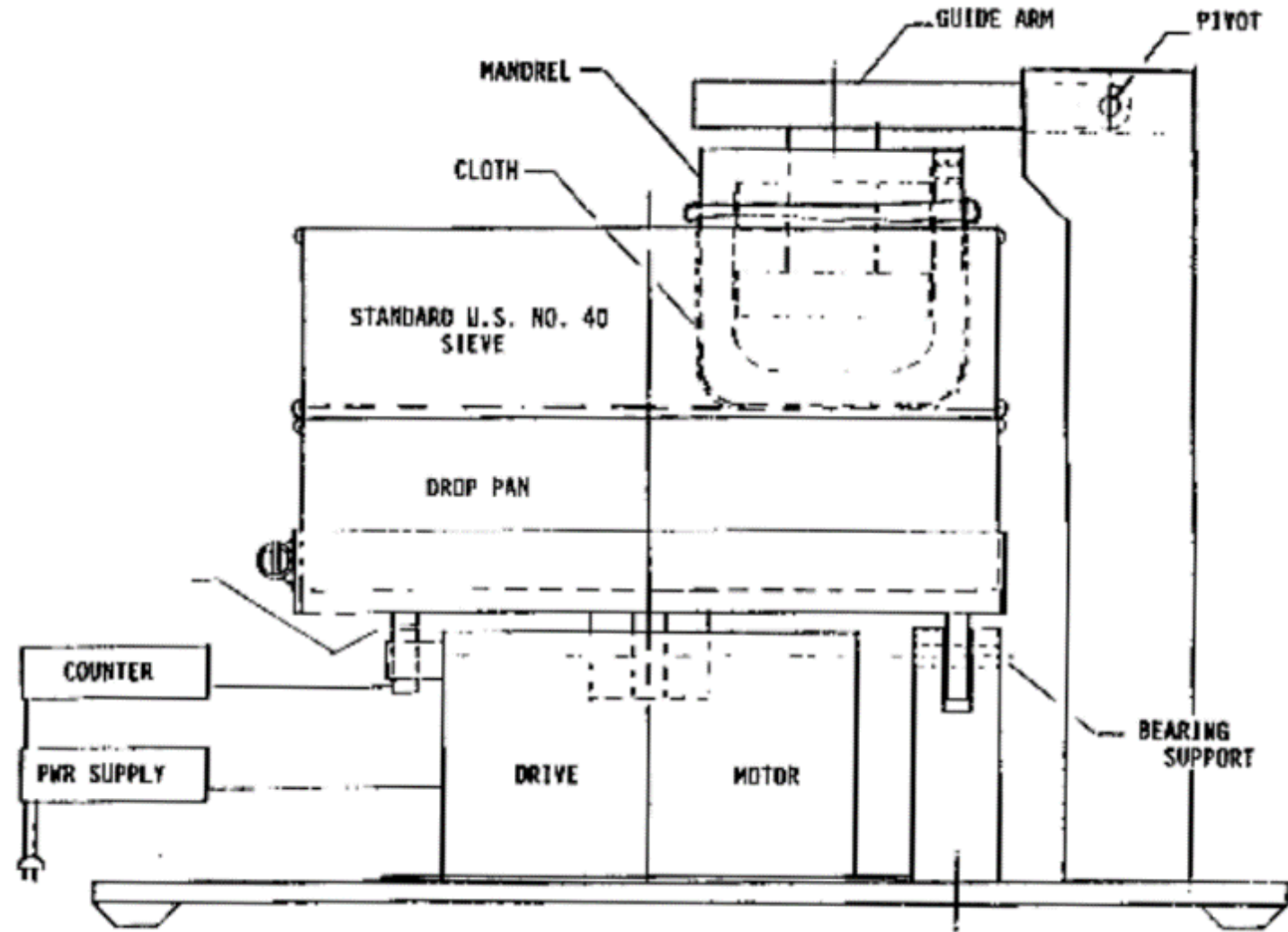
W₂ = weight of aluminum foil plus lint generated

bar. Tape may also be used to secure the bar to the cloth. The bar shall be ± 10 grams, with a contact surface of ± 10 square inches, and shall be used at 0.5 inch (12.7 mm) diameter. The test shall be performed in a hood with drop pan which has a temperature of 70 ± 2 °F (65 °C \pm 1 °C) for 1 hour; the bar shall be 10 inches (229 mm) in diameter,



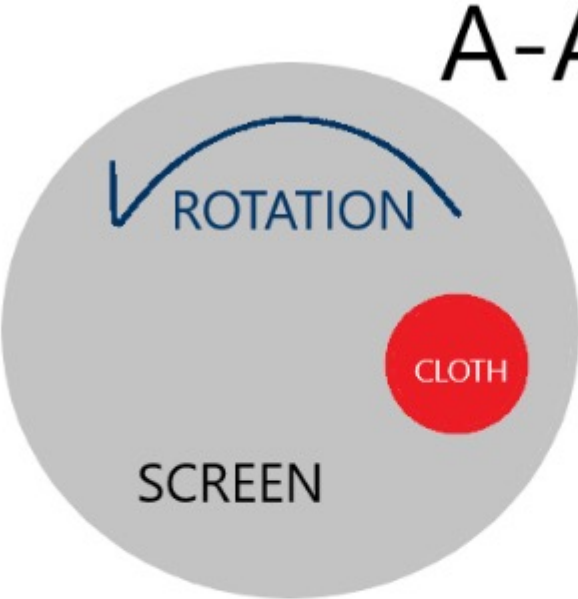
AMS 3819 TEST DEVICE

AS DESCRIBED IN AMS 3819 SECTION 4.7.4

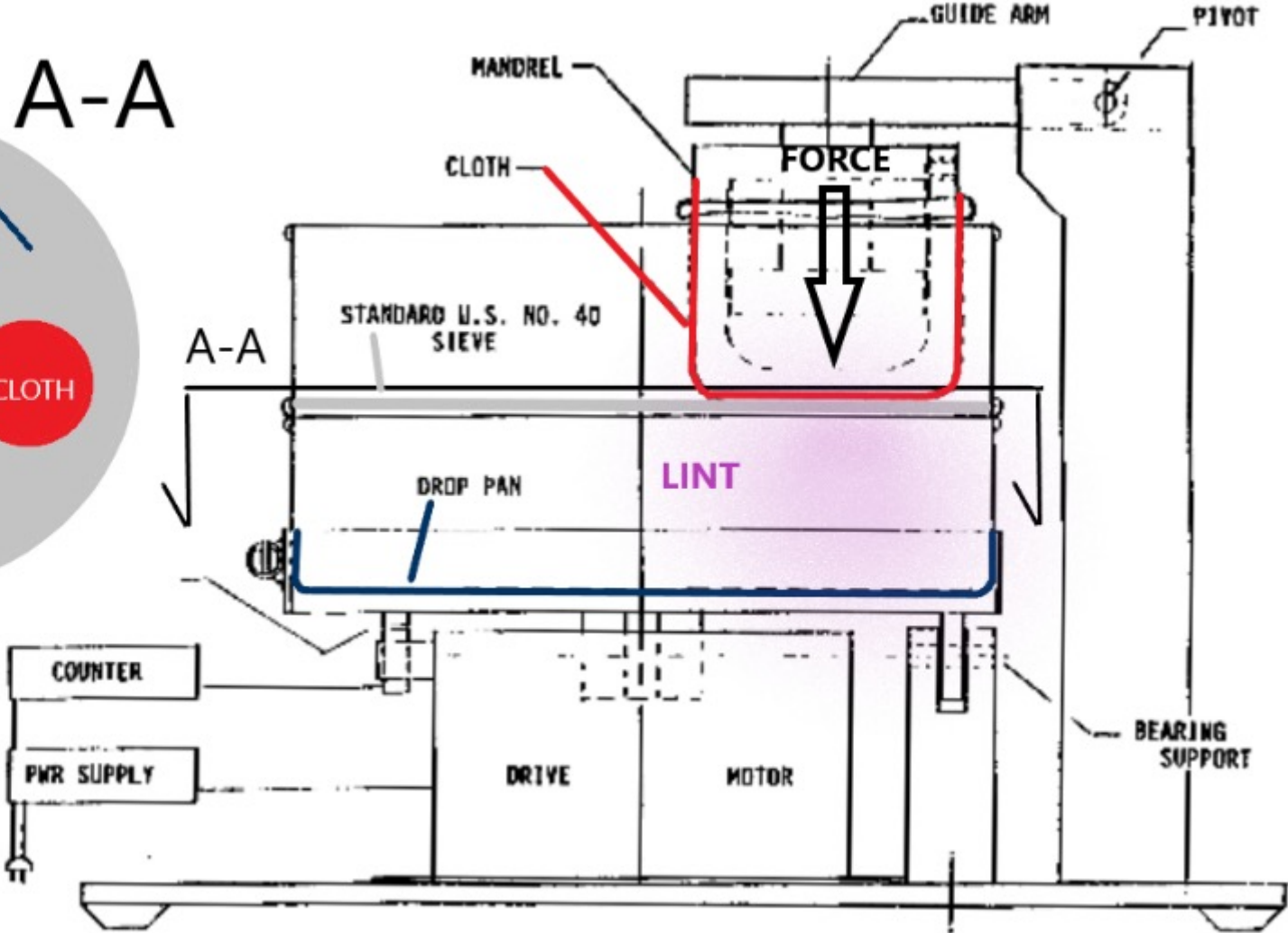


AMS 3819 TEST DEVICE

AS DESCRIBED IN AMS 3819 SECTION 4.7.4



A-A



WIPE SPECIFICATIONS

Conflict Between Established Specifications

SPEC	Requirement	
	Section	Clause
MIL-DTL-24671 (Lint-Free)	3.1 Material	Cotton
	3.1.5 Lint and Foreign Material	"...free from....of a size visible to the unaided eye"
A-A-59323 Low-Lint	3.1 Material	Knit construction of nylon or polyester yarn.
	N/A	no requirements/definition on "Low Lint" NOTE: Type I of the spec is stated for clean room use, "...LOW LINT wipers"
AMS 3819 Cloth for cleaning A/C surfaces	1.3 Classification	Class 1 – Woven, Cotton
		Class 2 – non-woven, 100% synthetic, blended synthetic, cotton, or cellulose materials
		Class 4 – knit cloth 100% polyester yarn.
	3.7.3 Lint Requirement	"...not more than 10mg/ft ²
4.7.4 Testing Method	Testing apparatus in Fig.2 (pg.12)	



WIPE SPECIFICATIONS

3 primary standard governing wiping cloth quality

Spec for Allowable Material		Manual calling out Wiping Cloth and referencing						
		"Low Lint" but without Spec	"Lint-Free" but without Spec	A-A-59323	AMS 3819			MIL-DTL-24671
					CL-1	CL-2	CL-4	
A-A-59323		X	X	X			X	
AMS 3819	CL-1	X	X		X		X	
	CL-2	X	X			X		
	CL-4	X	X	X			X	
MIL-DTL-24671		X	X		X		X	



WIPE SPECIFICATIONS

MIL-DTL-24671 and A-A-59323 do not have a Qualified Products List (QPL), but AMS 3819 does.

Located on the Performance Review Institute Website at <https://www.eauditnet.com/>

QPLS	Standard	Product Code	Manufacturer's Name	Manufacturer's Designation	Class Designation	Original Listing Date	Recoupled Listing Date	Expiration Date
1	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Aerotev/Purewipe Cheesecloth & Sponges	Class 1 Grade A Form 1	03/27/2022	AT501004_Level A	Project 7808, Project 12921
2	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Aerotev/Purewipe Cheesecloth & Sponges	Class 1 Grade A Form G	03/29/2022	AT501004_C_Level G	Project 7721, Project 12927
3	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Aerotev/Purewipe Cheesecloth & Sponges	Class 1 Grade A Form 1	08/25/2022	AT51326_Jr_Level J	Project 7820, Project 13401
4	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Aerotev/Purewipe Cheesecloth & Sponges	Class 1 Grade A Form 1	06/28/2022	AT51326_Fr_Level F	Project 12926
5	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Aerotev/Purewipe Cheesecloth & Sponges II	Class 1 Grade A Form 1	07/21/2022	AT51326_H_Level H	Project 13320
6	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Polyester Knit Wiper	Class 4 Grade A Form 1	06/05/2023	AT51450_A_Level A	Project 14521
7	PRI-QPL-AMS3819	AMS3819	American Fiber & Finishing	Purewipe BK Wiper	Class 2 Grade A Form 1	05/30/2019	AT501004_A	Project 7741

Standard	Product Code	Manufacturer's Name	Manufacturer's Designation	Class Designation	Expiration Date
PRI-QPL-AMS3819	AMS3819	Kimberly Clark Corporation Fujian Energy Nanfang Hygiene Materials Co., Ltd.	Kimtech® Aviation Surface Prep Wipe P2 28644	Class 2 Grade A Form 1	30-Aug-27



How Much Lint is
Acceptable in an FPI
Wipe?

WHAT SHOULD BE THE
LINT THRESHOLD

PROPOSAL:

ESTABLISH A LINT THRESHOLD CORRESPONDING TO AN INSPECTION LEVEL AT WHICH INTERFERANCE WITH THE DETECTION THRESHOLD OCCURS

REVISE LANGUAGE FOR WIPING MEDIA IN FPI STANDARDS TO:

- **RELAX LINT REQUIREMENTS BELOW THIS THRESHOLD**
- **REFLECT THIS THRESHOLD AT APPROPRIATE INSPECTION LEVELS**



WHAT SHOULD BE THE

LINT THRESHOLD

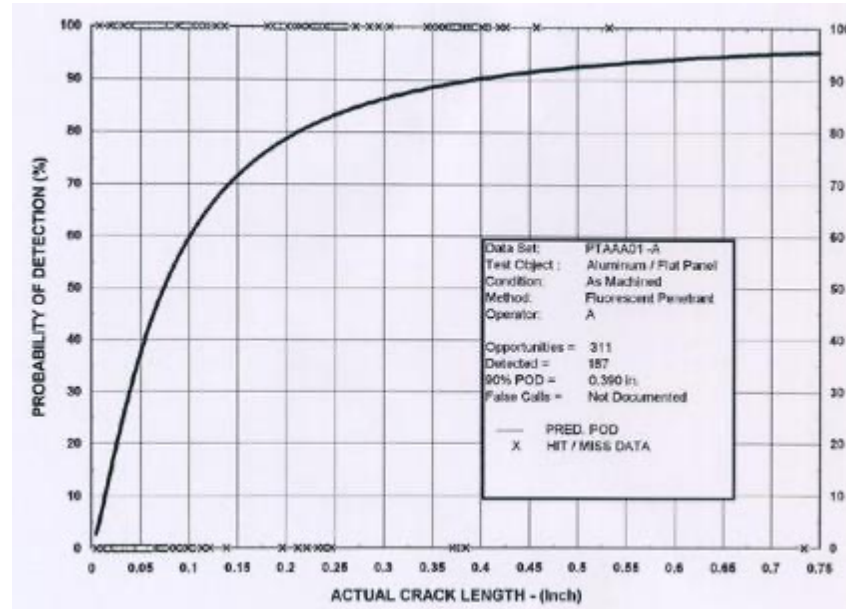
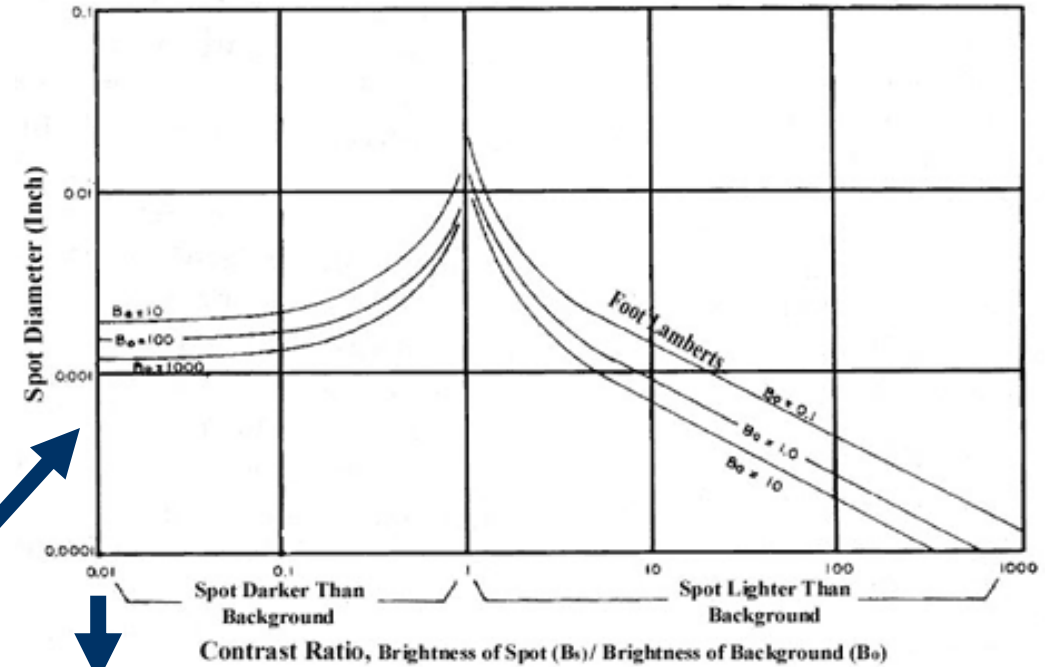
ESTABLISH A LINT THRESHOLD CORRESPONDING TO AN INSPECTION LEVEL AT WHICH INTERFERENCE WITH THE DETECTION THRESHOLD OCCURS

- Ample existing research on FPI POD for different conditions of background fluorescence



c/o Magnaflux

<https://magnaflux.com/Magnaflux/Blog/Brightness-and-Contrast-Impact-NDT>



Ref: De Graaf, E. and De Rijk, P., Comparison Between Reliability, Sensitivity, and Accuracy of Nondestructive Inspection Methods, 13th Symposium on Nondestructive Evaluation Proceedings, San Antonio, TX, published by NTIAC, Southwest Research Institute, San Antonio, TX, April 1981, pp. 311-322.

BOTH ©Iowa State University Center for Nondestructive Evaluation (CNDE).

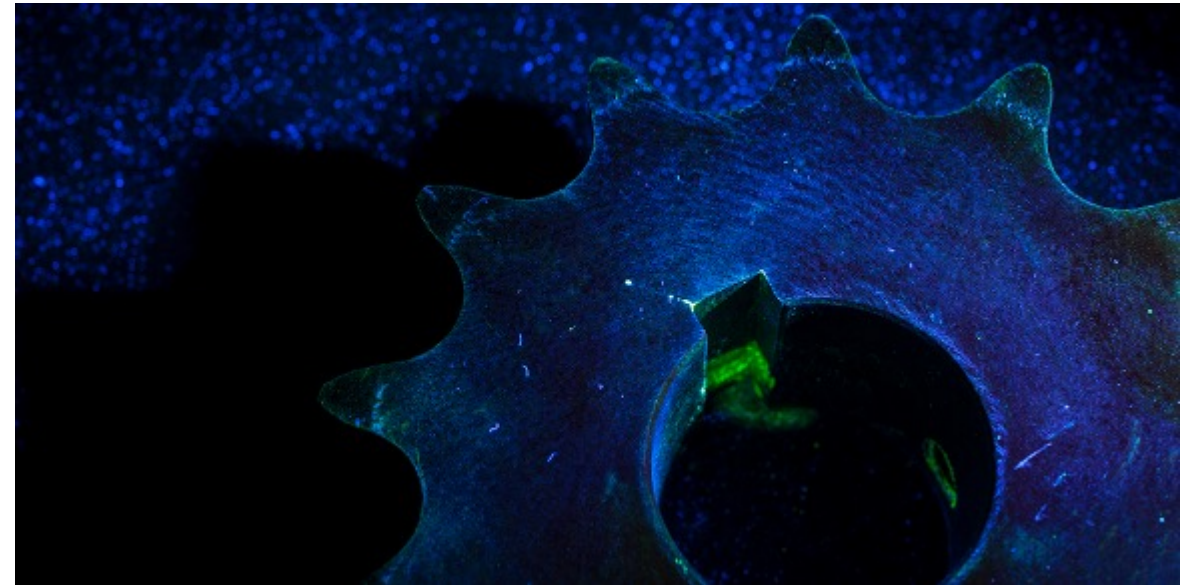


WHAT SHOULD BE THE

LINT THRESHOLD

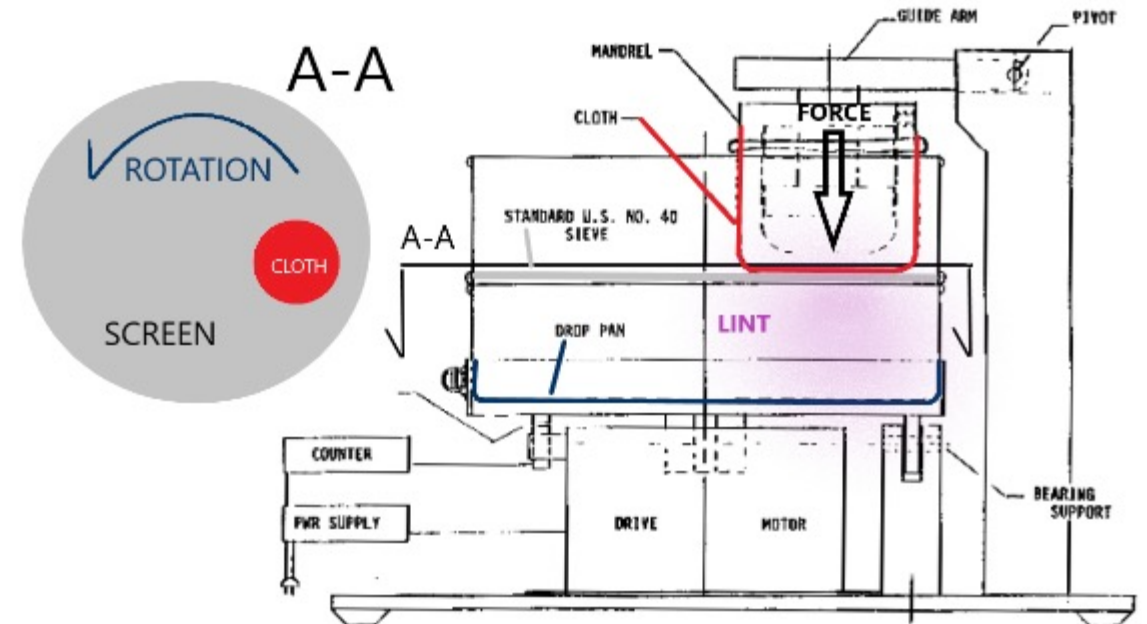
ESTABLISH A LINT THRESHOLD
CORRESPONDING TO AN INSPECTION LEVEL
AT WHICH INTERFERENCE WITH THE
DETECTION THRESHOLD OCCURS

- Ample existing research on FPI POD for different conditions of background fluorescence
- A study could establish a quantity of lint resulting from dynamic wiping that precipitates the threshold and correlates it with the AMS 3819 test results



c/o Magnaflux

<https://magnaflux.eu/en/Resources/Blog-Archive/Higher-Sensitivity-Penetrant-Improves-Inspection-Quality>



How Should Lint
Limits be Specified?

WHAT SHOULD BE THE LINT THRESHOLD

REVISE LANGUAGE IN ASTM 1417 AND AMS 2647 FOR WIPING MEDIA TO RELAX LINT REQUIREMENTS FOR METHODS UNAFFECTED BY LINT.

REVISE LANGUAGE IN ASTM 1417 AND AMS 2647 FOR WIPING MEDIA TO MEET MINIMUM TEST STANDARDS FOR METHODS SENSITIVE TO LINT AT THE THRESHOLDS CORRESPONDING TO AMS 3819 REQUIREMENTS.



AEROSPACE MATERIAL SPECIFICATION	AMS2647™	REV. G
	Issued	1985-04
	Revised	2021-09
Superseding AMS2647F		
Fluorescent Penetrant Inspection Aircraft Structures and Engine Component Maintenance		

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.



Designation: E1417/E1417M – 21¹

Standard Practice for Liquid Penetrant Testing¹

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 revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

¹ NOTE—Table 1 was updated editorially in December 2021.

1. Scope*

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-6866.

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 exact. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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.

NOTE 2—Throughout this document, the term *blacklight* has been changed to *UV-A* to conform with the latest terminology in Terminology E1316. *Blacklight* can mean a broad range of ultraviolet radiation; fluorescent penetrant examination only uses the UV-A range.

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee F07.03 on Liquid Penetrant and Magnetic Particle Methods.

Current edition approved Sept. 1, 2021. Published October 2021. Originally approved in 1991. Last previous edition approved in 2020 as E1417/E1417M – 20. DOI: 10.1520/E1417_E1417M-211601.

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 appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

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

2.2 *ASTM Standards*:²

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

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

E165/E165M Practice for Liquid Penetrant Testing for General Industry

E203 Test Method for Water Using Volumetric Karl Fischer Titration

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 For referenced ASTM standards, visit 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.

INTRODUCTION

This revision proposes a title change, adds a reference to a new paragraph defining penetrant process restrictions for throughout to remain consistent with AMS2644, "Process controls trials. Editorial changes are also included throughout to include "rotometer." Terminology has been updated throughout to remain consistent with technical negatives received from the first ballot 21 April 2021.

This standard is intended for use for the detection of defects in aircraft structural and engine components.

This standard provides additional guidance designed to supplement the document. Because the guidance contained in the appendices is advisory in nature, it is not intended to be binding unless specifically so stated by the Organization (CEO), an Original Equipment Manufacturer (OEM), or a user. Inspections to this specification should be familiar with the requirements of this guidance is necessary. The following appendices are included:

Appendix A—Background of Penetrant Systems

Appendix B—Background Fluorescence

Appendix C—Background Rotors/Deep Well Spools and Other Complex Parts w/Limited Penetration

This standard provides information on indications revealed by this inspection process shall be consistent with fluorescent penetrant inspection. Qualification of IAS 410, EN 4179, or ASNT SNT-TC-1A.

This standard is intended for use at overhaul facilities to inspect aircraft and engine components and where the inspection is specified, but usage is not limited to such applications.

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*A Summary of Changes section appears at the end of this standard

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