A Guide to ASTM Standards

September 2024

The Organization of Scientific Area Committees for Forensic Science, or OSAC, was established in 2014, in collaboration with NIST and the U.S. Department of Justice (DOJ) to help the forensic science community establish standards and best practices. These standards, published to the OSAC Registry, are developed in partnership with private standards developing organizations (SDOs).

This document is aimed at helping standards users understand standards on the OSAC Registry, particularly those published by ASTM. In addition to the specific standard appearing on each page, references are drawn from the Form and Style for ASTM Standards.

ASTM

Note that in contrast to ANSI/ASB's term of art usage, ASTM designates **all** of its documents as "standards." It produces documents under the following categories:

- **Test method**: An ASTM test method is "a definitive procedure that produces a test result." ASTM International, Form and Style for ASTM Standards, iv (Sept. 2022) (hereinafter, "ASTM Form"). This is a document that can set out requirements.
- **Practice:** An ASTM practice is "a set of instructions for performing one or more specific operations that does not produce a test result." *Id.* This is a document that can set out requirements.
- **Guides**: ASTM Guides are "compendium[s] of information or series of options that *do[] not recommend* a specific course of action." *Id.* (emphasis added).
- **Specification**: An ASTM specification is "an explicit set of requirements to be satisfied by a material, product, system, or service."
- **Classification**: An ASTM classification is a "systematic arrangement or division of materials, products, systems, or services into groups based on similar characteristics such as origin, composition, properties, or use."
- **Terminology**: An ASTM Terminology "a document comprising definitions of terms; explanations of symbols, abbreviations, or acronyms." *Id.*

ASTM Title and Designation

The ASTM title tells you the form of the document; this is a "Standard Practice," so it sets forth requirements.

This is the document designation. ASTM forensic science standards begin with "E"; the sequential number is unique to the standard. The last two digits reflect the year of revision or adoption.

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: E2917 – 24a

An American National Standard

Standard Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs[1]

This standard is issued under the fixed designation E2917; 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.

INTRODUCTION

Some material in this practice is based on the Technical Working Group for Education and Training in Forensic Science, National Institute of Justice (TWGED, NIJ), Special Report, *Education and Training in Forensic Science: A Guide for Forensic Science Laboratories, Educational Institutions, and Students* (1).[2]

1. Scope

1.1 This practice provides foundational requirements for the training, continuing education, and professional development of forensic science practitioners to include training criteria toward competency, documentation, implementation of training, and continuous professional development. This information is intended for forensic science service providers to help establish a training framework with program structure and content; for forensic science practitioners as they acquire and maintain their knowledge, skills, and abilities (KSAs); for subject matter experts when developing discipline specific training practices; and for training programs to manage and support the continuous development of their employees.

1.2 This practice outlines minimum training criteria and provides general information, approaches, and resources for all disciplines. The standard would complement additional specific requirements for each forensic science discipline (for example, relevant degree programs, higher education) if developed by subject matter experts in their respective fields. Discipline specific training programs should address the content and means for developing and testing competency for each applicable topic identified in Practice E2917.

1.3 *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.*

1.4 *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 *ASTM Standards:*[3]

E620 Practice for Reporting Opinions of Scientific or Technical Experts

2.2 *ISO Standards:*[4]

ISO/IEC 17011 Conformity Assessment—Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies

ISO/IEC 17020 Conformity Assessment—Requirements for the Operation of Various Types of Bodies Performing Inspection

ISO/IEC 17024 Conformity Assessment—General Requirements for Bodies Operating Certification of Persons

ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

3. Terminology

3.1 *Definitions:*

3.1.1 *apprenticeship, n*—a relationship where an individual works for an entity while learning skills (1).

[1] This practice is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.11 on Interdisciplinary Forensic Science Standards.

Current edition approved May 1, 2024. Published May 2024. Originally approved in 2019. Last previous edition approved in 2024 as E2917 – 24. DOI: 10.1520/E2917-24A.

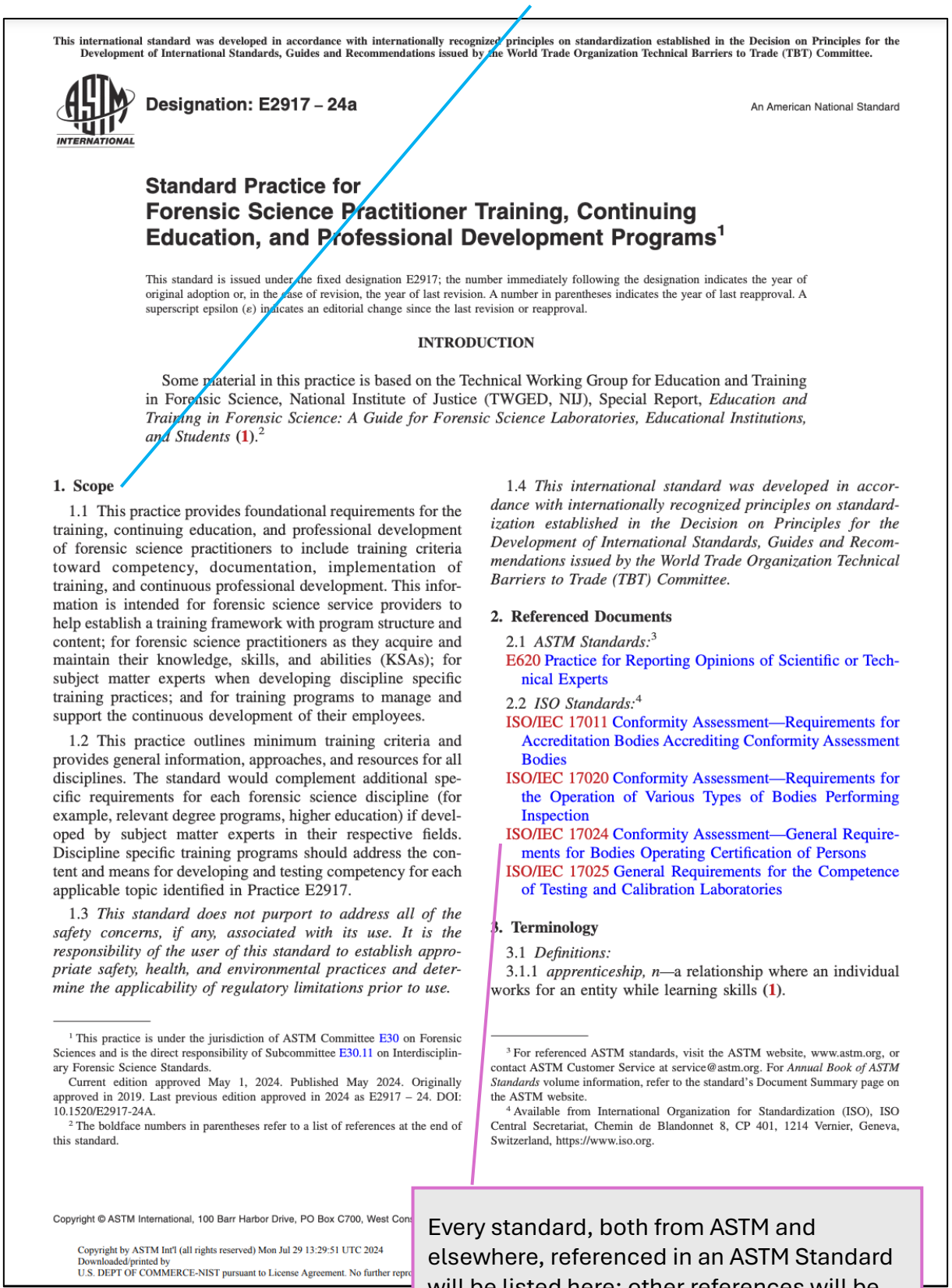
[2] The boldface numbers in parentheses refer to a list of references at the end of this standard.

[3] 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.

[4] Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, https://www.iso.org.

ASTM Scope and Reference Documents

ASTM standards do not typically contain the kind of introduction or foreword ASB standards do, but they do require a Scope section. That scope should explain what the standard purports to do and what its limitations are. It may also include references to other documents with which the standard should be read (for example, ANSI/ASTM E3085 – 17, *Standard Guide for Fourier Transform Infrared Spectroscopy in Forensic Tape Examinations*). *See* ASTM Forms A5, B5, C5 and, C19. In a test method document, the scope should "[s]tate if the method is quantitative or qualitative, and any known limitations." ASTM Forms A5.1.



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Every standard, both from ASTM and elsewhere, referenced in an ASTM Standard will be listed here; other references will be found in the "References" section. See ASTM Forms A6, B6, C6, C20. This section will give users an overview of how this standard interacts with others.

ASTM Terminology

All significant terms that may have a meaning more specialized than the commonly used language should be defined within a standard or the terminology standard should be referenced. ASTM Forms A7, B7, and C21. ASTM also has a master terminology standard for E30 forensic standards, E1732 – 24, *Standard Terminology Relating to Forensic Science*.

As with ANSI/ASB documents, special care must be taken with this section to be sure terms are understood as they were meant to be.

Designation: E2882 – 19

An American National Standard

Standard Guide for Analysis of Clandestine Drug Laboratory Evidence[1]

This standard is issued under the fixed designation E2882; 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.

1. Scope

1.1 This standard is intended to be used in conjunction with the general requirements for the analysis of seized drugs (Practices E2326, E2327, E2329, and E2549; Guides E2548 and E2329). This standard provides guidance on the chemical analysis of items and samples related to suspected clandestine drug laboratories. This standard provides general guidance for the analysis of clandestine drug laboratory evidence and is not a substitute for detailed and validated laboratory policies and technical procedures.

1.2 *This standard cannot replace knowledge, skills, or abilities acquired through education, training, and experience (see Practice E2326) and is to be used in conjunction with professional judgment by individuals with such discipline-specific knowledge, skills, and abilities.*

1.3 *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.*

1.4 *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 *ASTM Standards:*[2]

D6161 Terminology Used for Microfiltration, Ultrafiltration, Nanofiltration, and Reverse Osmosis Membrane Processes
E1605 Terminology Relating to Lead in Buildings
E2326 Practice for Education and Training of Seized-Drug Analysts
E2327 Practice for Quality Assurance of Laboratories Performing Seized-Drug Analysis
E2329 Practice for Identification of Seized Drugs
E2363 Terminology Relating to Process Analytical Technology in the Pharmaceutical Industry
E2548 Guide for Sampling Seized Drugs for Qualitative and Quantitative Analysis
E2549 Practice for Validation of Seized-Drug Analytical Methods
F2725 Guide for European Union's Registration, Evaluation, and Authorization of Chemicals (REACH) Supply Chain Information Exchange

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *capacity, n*—the amount of finished product that could be produced, either in one batch or over a defined period of time, and given a set list of variables. **SWGDRUG**[3]

3.1.2 *catalyst, n*—a substance whose presence initiates or changes the rate of a chemical reaction, but does not itself enter into the reaction. **D6161**

3.1.3 *finished product, n*—a manufactured product ready for use. **SWGDRUG**[3]

3.1.4 *intermediate, n*—substance that is manufactured for and consumed in or used for chemical processing to be transformed into another substance. **F2725**

3.1.5 *reagent, n*—a chemical used to react with another chemical, often to confirm or deny the presence of the second chemical. **E1605**

3.1.6 *yield, expected, n*—the quantity of material or the percentage of theoretical yield anticipated at any appropriate phase of production based on previous laboratory, pilot scale, or manufacturing data. **E2363**

3.1.7 *yield, theoretical, n*—the quantity that would be produced at any appropriate phase of production based upon the quantity of material to be used, in the absence of any loss or error in actual production. **E2363**

[1] This guide is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.01 on Criminalistics.
Current edition approved Aug. 1, 2019. Published August 2019. Originally approved in 2012. Last previous edition approved in 2012 as E2882 – 12. DOI: 10.1520/E2882-19.

[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.

[3] Available from the Scientific Working Group for the Analysis of Seized Drugs, http://www.swgdrug.org.

ASTM Significance and Use

This **mandatory section** in ASTM Standards "explains the relevance and meaning" of the test the standard describes. ASTM Forms A9, C8, and E12.

4. Significance and Use

4.1 An analyst should be knowledgeable, through established laboratory training, of clandestine drug laboratory synthetic routes and the techniques used in the analysis of related samples. This acquired knowledge of clandestine drug laboratory samples assists the analyst in choosing the best analytical scheme to identify reagents, precursors, intermediates, and final products.

4.2 The qualitative and quantitative analyses of clandestine drug laboratory evidence can require different approaches relative to routine seized drug analyses. Analysts shall understand the limitations of the procedures used in their qualitative and quantitative analyses. These include such factors as method selectivity, uncertainty, and the basis for inferences from a sample(s) to a population.

4.3 Laboratory management shall ensure that clandestine drug laboratory synthesis and analysis training be provided through relevant procedures, literature, and practical experience. Practical experience typically includes production, sampling and analysis of clandestine drug laboratory training samples.

4.4 Laboratory management shall ensure that chemical safety and hygiene plans address and mitigate hazards associated with clandestine drug laboratory evidence.

4.5 It does not address scene attendance or scene processing.

4.6 Laboratory management shall consider customer/local requirements which influence the application of these recommendations.

5. Safety

5.1 Many items seized at clandestine drug laboratories could be inherently hazardous. These could include items of unknown composition and chemicals that have not been fully characterized and whose specific hazards are not known. Therefore, exercise caution as routine safety protocols could be insufficient.

5.2 The following are required in addition to the routine laboratory safety program in place for the analysis of seized drugs (see Practice E2327):

5.2.1 Safety procedures and the use of safety and protective equipment for all staff responsible for handling items;

5.2.2 Protective breathing equipment;

5.2.3 Listings of the relevant hazards (for example, SDS) associated with components commonly found at clandestine drug laboratory sites and knowing what they mean; and

5.2.4 Accident prevention, emergency response procedures, and incident reporting protocols.

5.3 The handling, analysis, and storage of items seized from clandestine drug laboratories require additional procedures, facilities and equipment (see Practice E2327). Examples are:

5.3.1 Specialized ventilation equipment (for example, fume hoods) to prevent exposure to harmful fumes and vapors;

5.3.2 Provision of personal protective equipment such as safety glasses, chemical resistant gloves, laboratory coats, respirators, face masks, and air monitors;

5.3.3 Maintenance of a clean, uncluttered workspace;

5.3.4 Specialized emergency equipment stations;

5.3.5 Chemical disposal, destruction facilities, and procedures; and

5.3.6 Specialized evidence receipt, storage and disposal requirements designed to mitigate expected dangers (for example, limited sample size, proper packaging of reactive materials, use of absorbents, properly ventilated storage).

5.4 Analysts shall be aware of the hazards associated with clandestine drug laboratories samples. Examples are:

5.4.1 Extracting from strong acids and bases (for example, hydriodic acid, sodium hydroxide);

5.4.2 Handling fuming acids and bases (for example, hydrochloric acid, ammonia);

5.4.3 Poisonous gases (for example, phosphine, chlorine, hydrogen sulfide) and their potential release from evidence during analysis;

5.4.4 Poisonous, carcinogenic, and mutagenic materials (for example, mercuric chloride, chloroform, potassium cyanide);

5.4.5 Reactive and air sensitive materials (for example, white phosphorus, lithium);

5.4.6 Potential testing incompatibilities (for example, phosphorus with Raman, color test reagents with cyanide salts, exothermic reactions);

5.4.7 Radioactive materials (for example, thorium); and

5.4.8 Volatile and flammable solvents (for example, acetone, diethyl ether, methylated solvents).

6. Sample Section for Analysis

6.1 The primary purpose of analysis is to prove or disprove allegations of clandestine drug syntheses. Accordingly, analysts must select items which relate to the manufacturing process.

6.2 While not all-encompassing, sample selection can be based on the observations, case scenario, and preliminary field test results of the on-scene personnel.

6.3 Items should be selected for analysis (either at the scene or from items submitted to the laboratory), based on jurisdictional requirements, and which are likely to contain:

6.3.1 Finished product,

6.3.2 Intermediates,

6.3.3 Precursors,

6.3.4 Key reagents, and

6.3.5 Reaction mixtures.

6.4 The following types of items can be analyzed as they could assist in determining the chemical reaction(s) undertaken and the scope of the clandestine drug laboratory:

6.4.1 Materials that appear to be waste;

6.4.2 Unlabeled materials that appear to be contaminated solvents, acids, or bases; and

6.4.3 Samples from contaminated equipment.

6.5 Analysis is not required on all items, particularly if collected from sealed and labeled containers that are readily obtained from local retail stores and are sold from reputable manufacturers/distributors. These include:

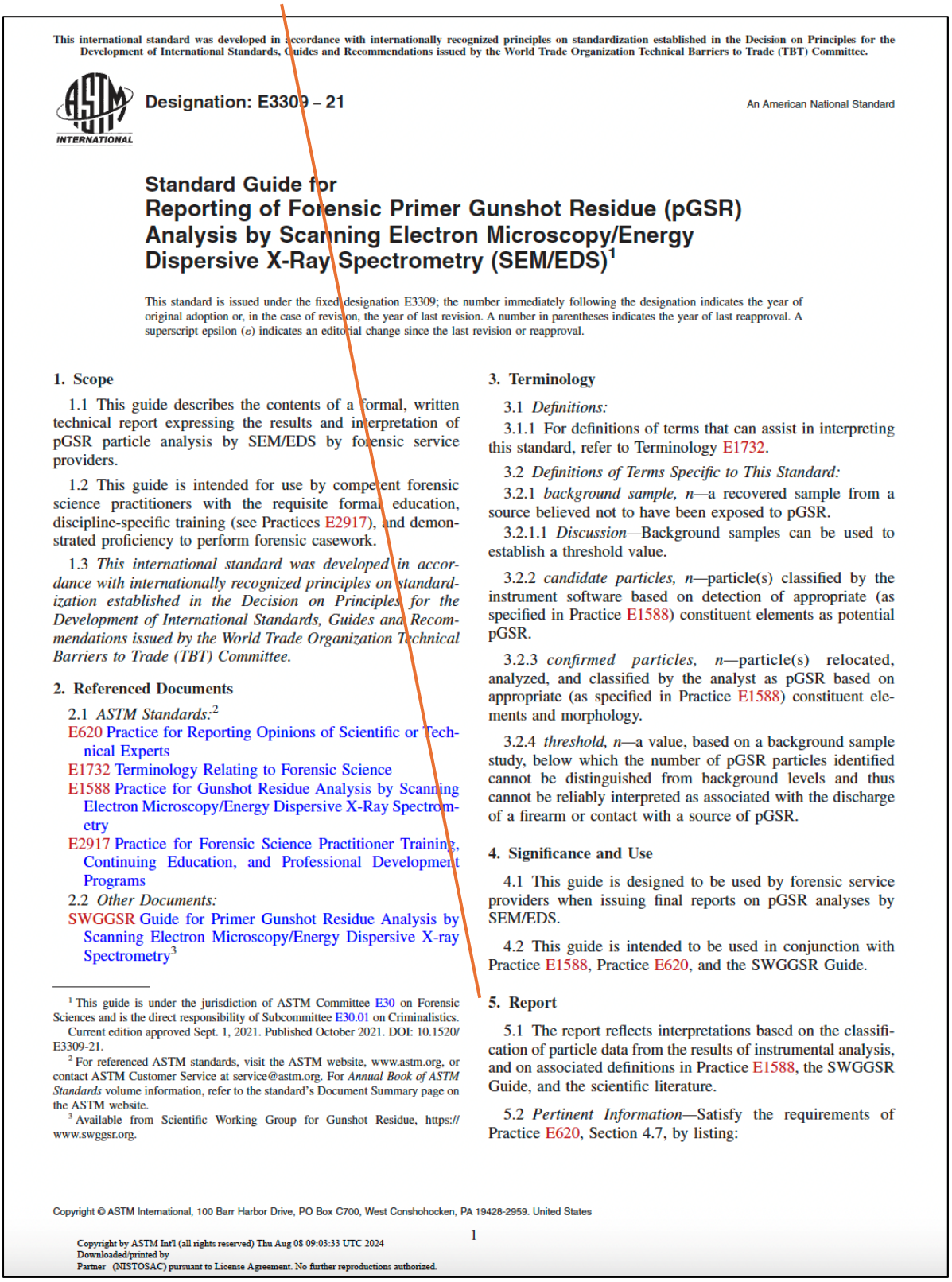
6.5.1 Solvents (for example, toluene, mineral spirits),

6.5.2 Acids (for example, hydrochloric acid, sulfuric acid),

ASTM Heading Variations

Example One: Report

The headers for the core of an ASTM Standard will vary. In this document on reporting, it is found in the section labeled “Report.”



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: E3309 – 21

An American National Standard

Standard Guide for Reporting of Forensic Primer Gunshot Residue (pGSR) Analysis by Scanning Electron Microscopy/Energy Dispersive X-Ray Spectrometry (SEM/EDS)[1]

This standard is issued under the fixed designation E3309; 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.

1. Scope

1.1 This guide describes the contents of a formal, written technical report expressing the results and interpretation of pGSR particle analysis by SEM/EDS by forensic service providers.

1.2 This guide is intended for use by competent forensic science practitioners with the requisite formal education, discipline-specific training (see Practices E2917), and demonstrated proficiency to perform forensic casework.

1.3 *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 *ASTM Standards:*[2]

E620 Practice for Reporting Opinions of Scientific or Technical Experts

E1732 Terminology Relating to Forensic Science

E1588 Practice for Gunshot Residue Analysis by Scanning Electron Microscopy/Energy Dispersive X-Ray Spectrometry

E2917 Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs

2.2 *Other Documents:*

SWGGSR Guide for Primer Gunshot Residue Analysis by Scanning Electron Microscopy/Energy Dispersive X-ray Spectrometry[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms that can assist in interpreting this standard, refer to Terminology E1732.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *background sample, n*—a recovered sample from a source believed not to have been exposed to pGSR.

3.2.1.1 *Discussion*—Background samples can be used to establish a threshold value.

3.2.2 *candidate particles, n*—particle(s) classified by the instrument software based on detection of appropriate (as specified in Practice E1588) constituent elements as potential pGSR.

3.2.3 *confirmed particles, n*—particle(s) relocated, analyzed, and classified by the analyst as pGSR based on appropriate (as specified in Practice E1588) constituent elements and morphology.

3.2.4 *threshold, n*—a value, based on a background sample study, below which the number of pGSR particles identified cannot be distinguished from background levels and thus cannot be reliably interpreted as associated with the discharge of a firearm or contact with a source of pGSR.

4. Significance and Use

4.1 This guide is designed to be used by forensic service providers when issuing final reports on pGSR analyses by SEM/EDS.

4.2 This guide is intended to be used in conjunction with Practice E1588, Practice E620, and the SWGGSR Guide.

5. Report

5.1 The report reflects interpretations based on the classification of particle data from the results of instrumental analysis, and on associated definitions in Practice E1588, the SWGGSR Guide, and the scientific literature.

5.2 *Pertinent Information*—Satisfy the requirements of Practice E620, Section 4.7, by listing:

[1] This guide is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.01 on Criminalistics.
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[3] Available from Scientific Working Group for Gunshot Residue, https://www.swggsr.org.

ASTM Heading Variations

Example Two: Summary of Technique

In this document E1969-19, *Standard Practice for Microcrystal Testing in Forensic Analysis for Methamphetamine and Amphetamine,* the core of the document is a detailed procedure, including materials lists and interpretations.

3.2.1 *aggregation, n*—the collecting of units or parts into a mass or whole.

3.2.2 *birefringence, n*—property of some crystals, those having more than one refraction index; this property will result in interference colors, which are viewed through a polarized light microscope.

3.2.2.1 *birefringent, adj*—material exhibiting birefringence.

3.2.3 *blades, n*—broad, flat, elongated crystals.

3.2.4 *grains, n*—thick tablets having nearly equal width, breadth and thickness.

3.2.5 *habit, n*—the external morphology of the crystal.

3.2.6 *microdrop, n*—a small drop of liquid that would fit on the end of a standard size, flattened toothpick; the approximate volume of this drop would be 10 to 25 µL.

3.2.7 *needles (acicular), n*—long, thin crystals with pointed ends.

3.2.8 *plates, n*—blades with nearly equal length and breadth and of a thickness substantially less than the width.

3.2.9 *rods, n*—long, thin crystals with squared off ends.

3.2.10 *tablets, n*—plates with appreciable thickness but less than the length or breadth.

4. Summary of the Technique

4.1 A small amount of test material containing the suspected methamphetamine or amphetamine is dissolved in an appropriate acid and the appropriate precipitating reagent is added. The crystals that are formed are observed and distinguished utilizing a light microscope.

4.2 If the proper formation of crystals is inhibited by the presence of diluents, a purification of the test material based on the volatility of methamphetamine and amphetamine could be performed.

5. Significance and Use

5.1 This technique involves a chemical-precipitation reaction between methamphetamine or amphetamine and the precipitating reagent. The habit and the aggregation of the crystals formed could be used to distinguish methamphetamine and amphetamine from other drugs, as well as from each other.

6. Interferences

6.1 *Diluents/Adulterants*—Diluents/adulterants present in combination with methamphetamine or amphetamine in the test material to be tested could inhibit crystal formation or could generate crystals that are distorted or otherwise rendered unidentifiable. Diluting the test material could reduce the interference. The higher the concentration of the adulterant the more difficult it will be to observe characteristic crystals. There could be cases where diluting the test material would not work. In these instances, it will be necessary to separate the methamphetamine or amphetamine from the diluents/adulterants or to use other testing methods to analyze the methamphetamine or amphetamine.

7. Apparatus

7.1 A standard light microscope capable of varying magnifications including 100× is needed for viewing the crystals. This is the minimum equipment required. A polarized light attachment is not essential, but is desirable, because the heavy metal crystals of methamphetamine and amphetamine are birefringent.

7.1.1 *Polarized Light Microscope (PLM),* capable of varying magnifications from 40× to 400×. The following are typical accessories on a PLM and could be useful, but are not required, to conduct microcrystalline testing: specialized rotating stage (360°) and compensator (retardation plate). Cross-polarizers are verified by observing a black background when the polarizer and analyzer are in the optical path at 90 degrees to one another (for example, polarizer is in the east-west direction and the analyzer is in the north-south direction).

7.1.2 The best practice for documenting the crystal formation results is to take a digital photograph. It is advised that the minimum equipment required also has the capability of digital photography.

8. Reagents and Materials

8.1 *10 % Solution of Hydrochloric Acid* (hereafter, dilute hydrochloric acid).

8.2 *Concentrated Phosphoric Acid.*

8.3 *1.0 N to 10.0 N Sodium Hydroxide.*

8.4 *Gold Chloride ($HAuCl_4$) Solution,* approximately 5 %, in reagent grade water. Gold chloride in phosphoric acid also is suitable; 1:2 5 % gold chloride/concentrated phosphoric acid.

8.5 *Platinum Chloride (H_2PtCl_6) Solution,* approximately 5 %, in reagent grade water. Platinum chloride in phosphoric acid also is suitable; 1:2 5 % platinum chloride/concentrated phosphoric acid.

8.6 *d-, l-, and dl- Amphetamine Standards.*

8.7 *d-, l-, and dl- Methamphetamine Standards.*

9. Sampling, Test Specimens, and Test Units

9.1 The general handling and tracking of samples should meet or exceed the requirements of Practice E1492 and Guides E1459 and E2548.

10. Performance Verification

10.1 Prior to use in casework, the reagents used for these microcrystal tests shall be tested for reliability using amphetamine and methamphetamine standards and negative controls following the prescribed procedure. Only when it is determined that the reagents are producing the expected response could the reagents be used in the testing procedure.

10.2 The microscope should be inspected, adjusted, and aligned to ensure it is in proper working order. This can be confirmed during the testing of the standard. Perform the analysis of unknown samples and standards under the same microscope operating procedures (for example, use of cross polarizers).

ASTM Keywords, References & Related Materials

Like ANSI/ASB documents, ASTM Standards contain key words.

TABLE 2 Sample Resolution Test Results

NOTE 1—Example resolution test results taken using an Epson flatbed scanner with an optical (machine) resolution of 2400 ppi. As the nominal resolution setting was increased beyond the optical resolution of the scanner that there was no increase in resolving power in spite of a large increase in both nominal resolution and file size.

Nominal Resolution	Reflected Resolving Power	
	Horizontal	Vertical
500 ppi	6 lp/mm	6 lp/mm
600 ppi	8 lp/mm	8 lp/mm
1000 ppi	12.5 lp/mm	12.5 lp/mm
1200 ppi	15 lp/mm	15 lp/mm
2400 ppi	25 lp/mm	25 lp/mm
4800 ppi	25 lp/mm	25 lp/mm

8.4 *When To Test:*

8.4.1 Flatbed scanners shall be tested prior to use for casework, as well as after being moved. The moving parts of the scanner can wear out and affect achievable resolution, therefore all flatbed scanners shall be retested every year.

9. Keywords

9.1 forensic science; digital camera; digital flatbed scanner; imaging resolution; latent print; resolving power

REFERENCES

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RELATED MATERIAL

Popular Photography Editors, *The Complete Photo Manual*, 2017.
SWGIT, "Section 8 — General Guidelines for Capturing Latent Impressions Using a Digital Camera."
SWGIT, "Section 19 — Issues Relating to Digital Image Compression and File Formats."
SWGIT, "Section 21 — Procedure for Testing Scanner Resolution for Latent Print Imaging."
SWGIT, "Section 22 — Procedure for Testing Digital Camera System Resolution for Latent Print Photography."

Some documents may also include "Related Material," which may be supporting information not necessarily directly referenced in the text.

While references to standards are contained in the Referenced Document Section, references to other literature may appear in this section. ASTM Forms A25, A26.3, B27, B28.3. If there are fewer than five references, they may instead be footnoted. These references should be "to publications supporting or providing needed supplementary information." Id.

ASTM Appendices & Annexes

ASTM standards may contain appendices or annexes.

Appendices are considered informative only and are not a mandatory part of the standard. A24, B26, E16.

Annexes, by contrast, which may contain "detailed information such as that on apparatus or materials that is . . . too lengthy for inclusion in the main text," **are mandatory** parts of the standard and should be understood as such. ASTM Forms A24, B26, E16.

activity of subject, elapsed time from discharge to collection, and environmental conditions (wind, rain, etc.) (12, 19, 23, 24 and 25).

(4) Collection factors including, but not limited to, condition of sampling surface being tested, and competence of the collection personnel (26 and 27).

(5) Analysis factors including, but not limited to, sampling plan, limit of detection, instrument performance, and presence of interfering materials on the adhesive surface of the sampling device that obscure pGSR.

5.6.2.2 *Secondary Transfer Considerations*—Factors that can influence the number of particles transferred (1, 28-33):

(1) Being in physical contact with an individual who has recently discharged a firearm.

(2) Being in physical contact with an inanimate object that has pGSR on it.

(3) Wearing an item of clothing that has pGSR on it.

5.6.2.3 *Tertiary Transfer Considerations*—Factors that can influence the number of particles transferred from secondary sources (33, 34):

(1) Being in physical contact with an inanimate surface that has secondary pGSR on it.

(2) Being in physical contact with an individual who has secondary pGSR on them.

6. Keywords

6.1 energy dispersive X-ray spectrometry; forensics; particle analyses; primer gunshot residue; service providers; scanning electron microscopy; technical reports

APPENDIXES

(Nonmandatory Information)

X1. THE GSR SPECIFIC PORTION OF THE REPORT: EXAMPLE 1

X1.1 Samples

Item 5 One (1) primer residue kit from John Smith
Item 7 One (1) primer residue kit from Jane Doe

X1.2 Methods

X1.2.1 Items 5 and 7 were examined using a scanning electron microscope with an energy dispersive X-ray spectrometer (SEM-EDS) for the presence of primer gunshot residue (pGSR) based on the elemental constituents and morphology of particles sampled from the item.

X1.3 Results and Interpretations

X1.3.1 Particles characteristic of primer residue are those that have a non-crystalline appearance and contain all three elements: lead, barium and antimony. Particles with these characteristics are strongly associated with the discharge of a firearm and are rarely found in particles from any other source.

X1.3.2 Particles consistent with primer residue have the same appearance and typically include two of the three elements listed above. This type of particle is often associated with the discharge of a firearm but can also come from numerous non-firearm sources.

X1.3.3 *Item 5:*

X1.3.3.1 Nine (9) particles characteristic of primer residue and one (1) particle consistent with primer residue were found in the area examined on the sample in Item 5 marked *right hand*. Six (6) particles characteristic of primer residue and three (3) particles consistent with primer residue were found in the area examined on the sample in Item 5 marked *left hand*. It should be noted that, as in accordance with laboratory standard practice, no more than 10 particles are confirmed per sample during a routine examination.

X1.3.3.2 The pGSR particles on Item 5 could have been deposited when *(1)* the person discharged a firearm; *(2)* the person was in the vicinity of a firearm discharge; or *(3)* the person came in contact with something that had pGSR on it. The number of confirmed particles cannot be used to determine which of these scenarios is more likely.

X1.3.4 *Item 7:*

X1.3.4.1 No pGSR particles were found in the areas examined on the samples in Item 7 marked *right hand* or *left hand*.

X1.3.4.2 Item 7 provides no indication that Jane Doe has an association with the discharge of a firearm. However, the absence of pGSR particles does not prove that a person did not discharge a firearm. It is possible that Jane Doe did discharge a firearm but that pGSR particles were not deposited, were removed by activity, or were not detected.

How ASTM Standards Appear on the OSAC Registry

This links to the standard at the standards developing organization.
Note: ASTM standards are only available for free if accessed through the OSAC Registry link.

This is the date the standard was added to the OSAC Registry.

- ANSI/ASTM E2917-19a *Standard Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs* | added November 5, 2019 | OSAC Public Comments | FACTSHEET | CHECKLIST

Public comments received during the OSAC review process can be found here.

This link is to a one-page factsheet produced by the American Academy of Forensic Science highlighting important parts about the standard. More about the factsheets can be found here.

This link is to a checklist produced by the American Academy of Forensic Science that breaks down standard language line by line. More about the factsheets can be found here.