Advancing the Application of Low-Cost Sensors with Voluntary Consensus Standards

Air Sensors International Conference | Data Sharing & Harmonization Session | Oakland, CA | September 14, 2018

EXTRA **THE**  **SUN** EXTRA

TWENTY-FOUR BLOCKS BURNED IN HEART OF BALTIMORE

CITY'S MOST VALUABLE BUILDINGS IN RUINS

LOSS VARIOUSLY ESTIMATED AT FROM $50,000,000 TO $80,000,000

BLAZE STILL SPREADING EASTWARD AND SOUTHWARD AT 3.30 A. M.

Starting In John E. Hurst Building The Fire Sweeps South To Lombard, East To Holliday And North To Lexington, Destroying Wholesale Business Houses, Banks,

Standards Are Needed in the Sensor Field to Advance Appropriate Utilization of Data

- Terminology
- Sensor Evaluation and Performance Classification
  - Defining Usage (Data Quality Objectives)
- Deployment and Siting
- Data Assimilation, Integration, Interpretation, and Exchange
- Calibration Practices
- Continuing Quality Assurance and Quality Control
  - Continuing Assessments After Deployment
- Reporting

Presentation Objectives

- Define standards and their benefits
- Introduce Standard Setting Organizations
- Introduce ASTM & history/activity in air quality standards
- Outline the ASTM model for developing voluntary consensus standards (VCS)
- Explain how the National Technology Transfer and Advancement Act (NTTAA) can advance VCS for low-cost sensors

What is a Standard?

ISO/IEC Guide 2: (1996) 2004 defines a standard as:

*"**a document, established by consensus** and approved by a recognized body, **that provides** for common and repeated use, rules, guidelines or characteristics **for activities or their results aimed at the achievement of the optimum degree of order in a given context**"*

Standards Provide Known Benefits

From Standardization News, July/August 2019:

*"**standards** are instrumental in helping to more rapidly **allow multiple companies to compete** at various points throughout supply chains, **thereby reducing cost, improving competitiveness, and enabling innovation.**"*

Standard Setting Organizations Publish Standards

American National Standards Institute (ANSI) coordinates and promotes VCS and serves as the U.S. representative in non-treaty international and regional standards-setting activities.

ASTM Is a Leading Standard Setting Organization

ASTM publishes six types of consensus-based standards:

Classification: a systematic arrangement or division of materials, products, systems, or services into groups based on similar characteristics such as origin, composition, properties, or use.

Guide: a series of options or instructions that do not recommend a specific course of action (supply information, create awareness).

Practice: a definitive procedure for performing one or more specific operations or functions that does not produce a test result.

Specification: an explicit set of requirements to be satisfied by a material, product, system, or service.

Terminology Standard: a document comprising definitions of terms; explanations of symbols, abbreviations, or acronyms.

Test Method: a definitive procedure that produces a test result.

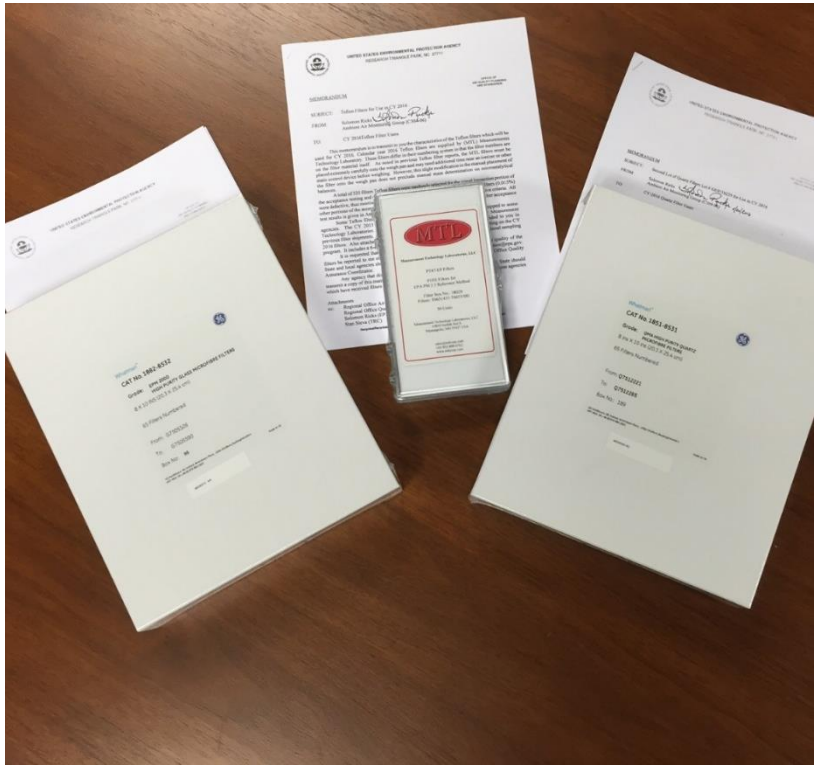
ASTM Has Been Publishing Air Standards Since 1951

ASTM Committee D22 on Air Quality

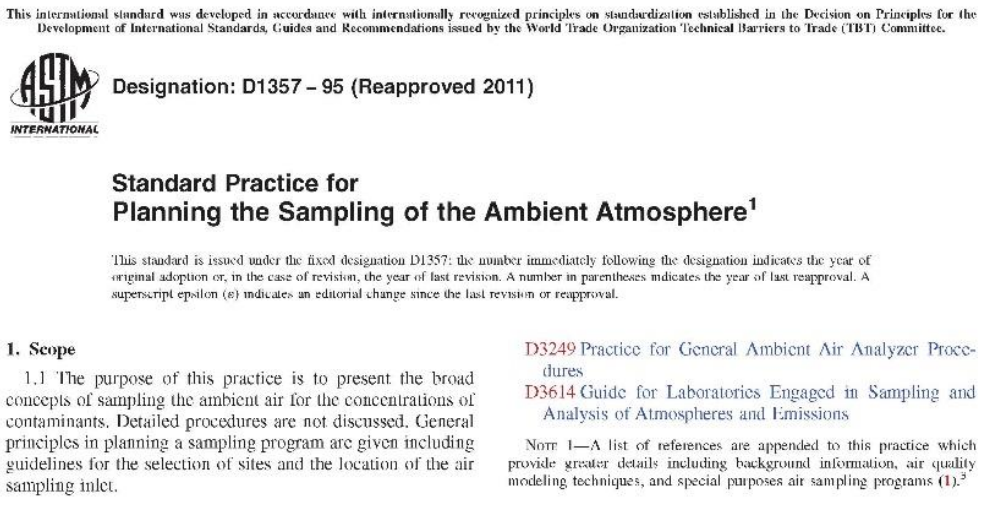
- Over 400 members
- Jurisdiction over ~125 standards
- Seven technical subcommittees
  - **D22.01 Quality Control**
  - **D22.03 Ambient Atmospheres and Source Emissions**
  - **D22.04 Workplace Air Quality**
  - **D22.05 Indoor Air**
  - D22.07 Sampling and Analysis of Asbestos
  - D22.08 Assessment, Sampling, and Analysis of Microorganisms
  - **D22.11 Meteorology**
- Represents US through ANSI on ISO TC146, Air Quality

Existing ASTM Standards Support Ambient Monitoring Programs

Subcommittee D22.03 on Ambient Atmospheres and Source Emissions has 52 active Standards covering a wide range of Practices and Test Methods



Existing ASTM Standards Can Be Tailored to Sensors



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: D1357 – 95 (Reapproved 2011)

Standard Practice for Planning the Sampling of the Ambient Atmosphere[1]

This standard is issued under the fixed designation D1357; 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.

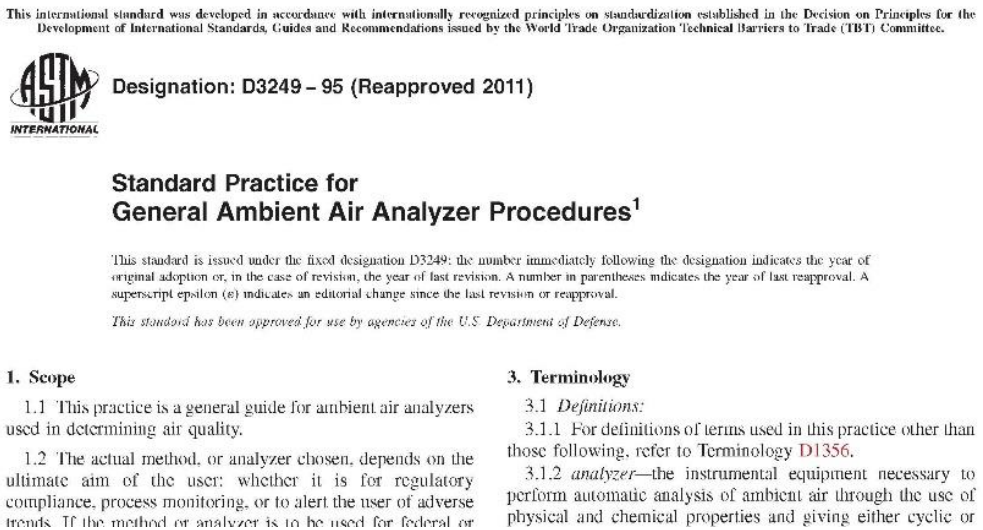
1. Scope

1.1 The purpose of this practice is to present the broad concepts of sampling the ambient air for the concentrations of contaminants. Detailed procedures are not discussed. General principles in planning a sampling program are given including guidelines for the selection of sites and the location of the air sampling inlet.

D3249 Practice for General Ambient Air Analyzer Procedures

D3614 Guide for Laboratories Engaged in Sampling and Analysis of Atmospheres and Emissions

NOTE 1—A list of references are appended to this practice which provide greater details including background information, air quality modeling techniques, and special purposes air sampling programs (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.

Designation: D3249 – 95 (Reapproved 2011)

Standard Practice for General Ambient Air Analyzer Procedures[1]

This standard is issued under the fixed designation D3249; 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. Scope

1.1 This practice is a general guide for ambient air analyzers used in determining air quality.

1.2 The actual method, or analyzer chosen, depends on the ultimate aim of the user; whether it is for regulatory compliance, process monitoring, or to alert the user of adverse trends. If the method or analyzer is to be used for federal or

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice other than those following, refer to Terminology D1356.

3.1.2 *analyzer*—the instrumental equipment necessary to perform automatic analysis of ambient air through the use of physical and chemical properties and giving either cyclic or

ASTM Sensor Standards Under Development

- ASTM D22.03 - WK64899 Performance Evaluation of Ambient Air Quality Sensors and Other Sensor-based Instruments (Technical Contact: Geoff Henshaw) – Collaboration Group Established and Draft Posted

- ASTM D22.05 - WK62732 * Performance Evaluation of Consumer-Grade Indoor Air Quality Sensors and Sensing Devices (Technical Contact: James Moore) – Collaboration Group Established and Draft Posted

ASTM Standard Development Process

1. Need is Recognized
2. Work Group Develops Standard
3. Standard is Balloted (2X)
4. Standard is Approved
5. Standard is Published
6. Standard is Used

NTTAA Eases Regulatory Adoption of Voluntary Consensus Standards

- Signed into law in 1996 to foster innovation and commercialization of technology
- **Mandates that agencies use technical standards developed or adopted by voluntary consensus bodies, as opposed to government unique standards**
  - **Procurement**
  - **Regulatory activities**
- Agencies also encouraged to participate in VCS development process including voting

ASTM Provides a Forum for Standards Development in the Sensor Field

- ASTM is a recognized SSO with more than 65 years of experience developing air-related standards
- ASTM's standards development process is documented and open
- ASTM D22 can accommodate standards development for sensors in all areas:
  - Terminology
  - Sensor Evaluation and Performance Classification
  - Deployment and Siting
  - Data Assimilation, Integration, and Exchange
  - Calibration Practices
  - Reporting
- And in case you are wondering….

Thank you

Questions?

David L. Elam, Jr.
P: 919.622.1846 | **E:** delam@trcsolutions.com
www.trcsolutions.com