Designation: E678 – 07 (Reapproved 2013)

Standard Practice for Evaluation of Scientific or Technical Data[1]

This standard is issued under the fixed designation E678; 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 practice establishes criteria for evaluating scientific and technical data, and other relevant considerations, which constitute acceptable bases for forming scientific or technical expert opinions.

1.2 This practice recommends generally acceptable professional practice, although the facts and issues of each situation require specific consideration, and may involve matters not expressly dealt with herein. Deviations from this practice are not necessarily wrong or inferior, but should be documented and justifiable, if compliance with this standard is claimed. Not all aspects of this practice may be applicable in all circumstances.

1.3 This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances.

1.4 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E620 Practice for Reporting Opinions of Scientific or Technical Experts

E860 Practice for Examining And Preparing Items That Are Or May Become Involved In Criminal or Civil Litigation

E1020 Practice for Reporting Incidents that May Involve Criminal or Civil Litigation

E1188 Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator

3. Significance and Use

3.1 Persons engaged in forensic investigations are responsible for identifying significant data. They then analyze and correlate the data and report conclusions and opinions. These opinions should be supported by the data, reported in a form that is understandable to a layman familiar with the incident, and capable of being evaluated by knowledgeable scientists, engineers, or investigators.

3.2 This practice is intended to serve as a guideline for the scientific or technical expert in conducting an investigation, which includes analyzing and evaluating facts. In addition, this practice may assist others in understanding and evaluating the work performed. Refer to Practice E1188 for guidance pertaining to the actual collection of information and physical evidence, and Practice E1020 for guidance regarding the initial reporting of the incident.

4. Evaluation Procedure

4.1 This section outlines basic principles of evaluation in accordance with accepted scientific and engineering practices.

4.1.1 *Define the Problem Being Considered: The definition should include*—The expert must first define the problem being considered. The definition should include: (*1*) the allegation(s) made, (*2*) the scientific or technical issues being addressed, (*3*) the relationship between the allegation(s) and the scientific or technical issue(s), and (*4*) the relationship(s) between the scientific or technical issue(s) and the incident(s) to which the allegations(s) refer.

4.1.2 *Identification and Validity of Hypotheses:*

4.1.2.1 State and, if necessary, explain scientific or technical hypotheses and judgmental criteria used in evaluation. Specify the source, scientific and technical basis, and relationship of each hypothesis and criterion to known incident data

4.1.2.2 Address the relative scientific or technical merits of alternate hypotheses supported by the available data.

4.1.3 *Evaluation Techniques:*

4.1.3.1 Prepare and maintain a logical and traceable record of analysis and deduction. The evaluation should be quantified to the extent feasible, but should not assume greater precision than is warranted by the quality of the available data. Numerical probability estimates are acceptable only when based on

[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 March 1, 2013. Published March 2013. Originally approved in 1980. Last previous edition approved in 2007 as E678 – 07. DOI: 10.1520/E0678-07R13.

[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.

sound analytical or statistical principles, and when their confidence limits have been calculated.

5. Data for Evaluation

5.1 The evaluation process is based on the information collected and is intended to determine the most logical or reasonable explanation of the incident, accounting for all significant data. Consider three factors: (*1*) identification of the source of the data (*2*) identification of the source validity of the data; and (*3*) relevance of the data gathered.

5.1.1 Examples of data include: (*1*) observed or reconstructed objects or events (*2*) physical characteristics of persons, things and conditions involved (*3*) dates, times and locations; (*4*) physical injuries to persons and damage to objects; (*5*) product information and conditions of use

5.1.2 *Identification of Source of Data:*

5.1.2.1 Catalog all data made available to or collected by the investigator by relationship to the incident and physical characteristics. Identify quantitative data by type, for example, raw, reduced and interpreted. Specify the basis for any data reduction or analysis.

5.1.2.2 Data may also be identified by source, date, time and place. Sources may be categorized as: (*1*) testimonial (statements, affidavits, pleadings, depositions, interrogatories, etc.) (*2*) documentary (specifications, records, reports, publications, literature, manuals, drawings, photographs, etc.), and (*3*) physical (components, specimens, samples, etc.). Identify distinguishing characteristics as clearly as possible to fulfill evidentiary requirements.

5.1.3 *Validity of Data*—Validity of data may be subject to question unless it has been generated by established procedures, such as those specified in Practice E860, and generally accepted test methods.

5.1.3.1 Specify the source(s) of other data used in the evaluation. This practice does not preclude the use of data developed for other purposes where such data can be shown to be relevant to the conditions of the incident. Data published in peer-reviewed professional journals is generally regarded as having more validity than data published in sources without peer review.

5.1.4 *Relevance of Data*—When reconstructing a historical event, the investigator is likely to observe more data than is pertinent to the reconstruction. Professional judgment is required to assess whether a particular piece of data is relevant.

6. Opinions

6.1 Opinions should be formed or conclusions drawn only after the data have been evaluated. Opinions or conclusions must account for all known relevant facts related to the incident and be consistent with accepted scientific and logical principles.

7. Report

7.1 If a report is to be prepared, guidance on report preparation may be found in Practice E620.

8. Keywords

8.1 data evaluation; data validation; forensic science; technical data