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Standard Practice for Evaluation of Technical Data¹

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1. Scope

1.1 This practice covers the evaluation of technical data, appropriate criteria for such evaluation, and other relevant considerations which constitute a proper basis for forming technical opinions. This practice deals with hypotheses and opinions based on consideration and analysis of technical data. The approach outlined is recommended as good professional practice even though the facts and issues of each situation require specific consideration, and may involve matters not expressly dealt with herein.

1.2 For additional standards promulgated by ASTM Committee E-30 on Forensic Sciences, see Practices E 620, E 860, E 1020, and E 1188.

2. Referenced Documents

2.1 ASTM Standards:

E 620 Practice for Reporting Opinions of Technical Experts²

E 860 Practice for Examining and Testing Items that Are or May Become Involved in Litigation²

E 1020 Practice for Reporting Incidents²

E 1188 Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator²

3. Significance and Use

3.1 The responsibility of the technical expert in a forensic investigation encompasses identifying significant data pertinent to the incident and related to the expert's opinion, analyzing and correlating the data with respect to the incident, and providing a meaningful explanation of the results to the nontechnical as well as the technical community.

3.2 This practice is intended to serve as a guideline for the 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.

4. Evaluation Procedure

4.1 This section outlines the basic principles of technical evaluation in accordance with scientific practice and engineering methods.

4.1.1 *Definition of the Problem*—The expert must first define the problem being considered. The definition should include: (1) the complaint(s) or allegation(s) being addressed, (2) the technical issues addressed, (3) the relationship between the technical issue(s) and complaint(s) or allegation(s) addressed by the expert, and (4) the relationship between the technical issue(s) addressed and the incident.

4.1.2 *Identification and Validity of Hypotheses*:

4.1.2.1 The expert shall identify and, if necessary, explain technical hypothesis and judgmental criteria used in an evaluation. The source, technical basis, and relationship of each hypothesis and criterion to known incident data shall be specified.

4.1.2.2 If available data permit alternative hypotheses, the relative technical merits of each shall be addressed.

4.1.3 *Evaluation Techniques*:

4.1.3.1 The record of analysis and deduction shall be reasoned and traceable. The evaluation shall be quantified to the extent feasible, but should not assume greater accuracy than is warranted by the quality of the available data. Probability estimates are not acceptable until confidence limits have been calculated and confirmed.

5. Data for Evaluation

5.1 The evaluation process is based on the information collected and is intended to determine the most logical explanation of the incident, accounting for all significant data. Three factors that shall be considered are (1) data included in the information base; (2) identification of the source and character of the data; and (3) validity of the data.

5.1.1 Data include observed and reconstructed events, physical characteristics of people, things and conditions involved, times and locations, physical injuries to people and damage to things, etc. Table 1 contains a list of typical correlative information and types of specific data that may be significant during evaluation. The use of a checklist similar to Table 1 is recommended as a systematic tool to verify that available and pertinent information has been included in the evaluation.

¹ This practice is under the jurisdiction of ASTM Committee E-30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.11 on Interdisciplinary Forensic Science Standards.

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² *Annual Book of ASTM Standards*, Vol 14.02.



TABLE 1 Correlative Information

Classifications and Considerations	Types of Data
A. Product Characteristics:	
a. Design	physical and functional relationships; demand capacity; safety factor; stability; dimensions; materials; compatibility; durability; reliability; safety; serviceability; specifications; etc.
b. Purchasing	specifications; vendor qualification; records; etc.
c. Manufacturing	accuracy; consistency; etc.
d. Quality assurance	inspection; testing, performance monitoring; deviations; substitutions; records; etc.
e. Labels and instructions	identification; instructions for assembly, installation, use, maintenance, repair; warnings; etc.
f. Marketing	claims; statements; inferences; disclaimers; warranties; etc.
g. Field performance history	function; effectiveness; durability; reliability; safety; etc.
h. Modification	by manufacturer, seller, contractor, owner, user, other; accidental; time; etc.
B. Conditions of Product Use:	
a. Imposed demands	patterns of load, pressure, speed; frequency of operation, total time of operation; power source fluctuation; etc.
b. Environment	temperature; humidity; air circulation; visibility; vibration; noise; foreign materials; abrasion; corrosion; etc.
c. Installation, maintenance, and servicing	by manufacturer, seller, contractor, owner, user; adequacy; records; etc.
C. Human Characteristics:	
a. Applicability	owner; operator; bystander; recipient; etc.
b. Physical	age; size; strength; health; medication; etc.
c. Expertise	education; training; knowledge; understanding; technique; skill; capability; etc.
D. Other:	
a. Capability	state of technical art; state of commercial art; etc.
b. Requirements	standards; regulations; codes; statutes; ordinances; mandates; customer specifications; etc.
E. Interactions:	
a. Applicability	among classifications A, B, C, and D
b. Considerations	physical; chemical; psychological, etc. (Factors may alter safety and effectiveness in specific combinations.)

5.1.2 Identification of Data:

5.1.2.1 All data made available to or collected by the expert shall be catalogued by relationship to the incident and physical characteristics. All quantitative data shall be identified by type, for example, raw, reduced, interpreted, etc. The basis for any data reduction or analysis shall be specified.

5.1.2.2 Data may also be identified by source, time and place, relationship to the incident. 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.). Distinguishing characteristics shall be identified as specifically as possible to fulfill evidentiary requirements.

5.1.3 Validity of Data:

5.1.3.1 Test data developed for an evaluation shall be obtained by relevant standard tests or by tests which replicate the conditions of the incident. If qualified, the expert shall

perform or witness tests specifically conducted for the evaluation. As an alternative, the tests shall be performed under the expert's direct supervision. In either case, the expert shall prepare a formal test plan which shall form the basis for the test protocol and reports.

5.1.3.2 Reference must be made to the source(s) of other data used. 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.

6. Opinions

6.1 After the data have been evaluated, opinions may be formed and conclusions drawn. Conclusions must be consistent with known facts surrounding the incident and with accepted scientific principles.

7. Keywords

7.1 forensic science; technical data

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