



Designation: E 1484 – 92 (Reapproved 1997)

Standard Guide for Formatting and Use of Material and Chemical Property Data and Database Quality Indicators¹

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1. Scope

1.1 This guide provides recommended formats and guidelines for the use of data quality indicators for material and chemical property data and databases.

1.2 The principal content of this guide is the identification of the key indices of data and database quality and reliability. It is recognized that actual usage and application to individual databases and data systems may vary appreciably without minimizing the value of the process.

1.3 While these guidelines have been established with computerized databases in mind, many of the elements of quality and reliability covered are equally applicable to data provided through other media.

2. Referenced Documents

2.1 ASTM Standards:

E 1013 Terminology Relating to Computerized Systems²

E 1407 Guide for Materials Database Management²

3. Terminology

3.1 Terminology has been defined in Terminology E 1013 and Guide E 1407, with the following additions.

3.2 Definitions:

3.2.1 *certification*—the process of formal approval, by an authority empowered to do so, of the use of specific data or a database for a specific application.

3.2.2 *data quality indicator*—any of several descriptors characterizing the quality of a data record, a database, or of the operation of a data system, to enable a user to make an assessment of the data, database, or data system for the intended purpose.

3.2.3 *evaluation*—the process of establishing the accuracy and reliability of property data. Evaluation involves examination and appraisal of the data involved (typically raw data), assessment of experimental technique and associated errors, comparison with other experimental or theoretical values, adherence to known physical or empirical laws, reanalysis and recalculation of derived quantities as required, selection of best values, and assignment of probable error or reliability. For test-dependent (non-intrinsic) properties, measured by standard tests, validation and evaluation are synonymous. For intrinsic properties, which may be measured by any of several test methods, evaluation may be

necessary to provide assurance as to the accuracy and reliability of the data.

3.2.4 *raw data*—experimental test results, typically data which have not been analyzed, evaluated, or combined, in any way, with other test results.

3.2.5 *reliability*—an indication of the dependability of the database information in terms of accuracy and precision.

3.2.6 *security*—protection of database information from unauthorized access, use, modification, destruction, or disclosure.

3.2.7 *validation*—the process of substantiating that test data have been generated according to standard test methods and practices, or other indices of quality, reliability, and precision.

4. Significance and Use

4.1 Decisions about the utility of material properties data and databases are facilitated by the use of quality indicators which provide potential users with information regarding the data source, reliability, validity, currency, and completeness, among other things. With this information, the user should be able to make an assessment of the applicability of the data or database for the intended purpose.

4.2 Database builders and maintainers are encouraged to use the quality indicators to provide guidance to users in determining the quality, reliability, and applicability of the data.

5. Quality Indicators

5.1 There are nine indicators, summarized as follows, and described in detail in Section 6, which may be used to describe the quality of a data record or database. The descriptors are divided into those applying to a data record and those applying to complete databases.

5.1.1 The fields contain only codes representative of a fact or factor indicative of data or database quality. They do not include the descriptive material itself (such as the name of the source document or the identity of the evaluator of the database).

5.1.2 The field numbers below have no significance except as references in this guide. There is no intent that they be used in the particular sequence presented, nor that all will be used in every application.

5.1.3 Alphabetic abbreviations are provided for the quality indicators. Their use is not required. In any case where alphanumeric codes are employed as part of a quality indexing procedure, their meaning should be clearly explained.

5.1.4 Individual applications of the quality indicators may include additional criteria at the choice of the database

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² *Annual Book of ASTM Standards*, Vol 14.01.

builder, manager, or distributor. In any case where additional criteria are employed, they should be individually explained for users.

5.2 Quality Indicators—See Table 1.

6. Guidelines for Use of Indicators

6.1 *Field No. 1—Source of Data or Database*—Identification of the type of publication or document from which the data were taken. The user may correctly place more credibility in one type of source than another and can utilize this information in deciding whether or not and, if so, how the information will be of value to him.

6.2 Field No. 2—Statistical Basis of Data:

6.2.1 This field is among the most important because it indicates to the user one important measure of the degree to which data can be directly compared to other data on an equal basis and if the data can be used for design, or if their principal value is for rough comparison. Single point test

values are of lowest reliability for most purposes but are often of interest when developmental materials are being considered.

6.2.2 Some design databases (for example, MIL-HDBK-5³) contain both specification minimum values and statistically processed A and B design values. Such databases will be given the designation D to indicate that both are present. Specification limits may include both minimum and maximum values; the distinction must be made clear to the user.

6.3 Field No. 3—Material Development/Production Status:

6.3.1 Is the material currently available commercially, is it in the research or development stage and, therefore, not available commercially, or is it an obsolete material, no longer available commercially?

6.3.2 Many users will be interested in finding data on materials in the developmental or research stage, and this field will assist them in finding data or databases which have such information.

6.4 *Field No. 4—Validation Status*—Were the test data generated according to a standard test procedure and was the data validated by a recognized and competent method?

6.5 *Field No. 5—Evaluation Status*—Were the test data evaluated by an expert body or individual to determine reasonableness, fit with theory or expectations? Evaluation may be the same as validation or may be a more complex process. For test-dependent properties (non-intrinsic properties) measured by standard test, validation and evaluation are synonymous. For intrinsic properties, which may usually be measured by any of several test methods, evaluation may be necessary to provide assurance as to the accuracy and reliability of the data.

6.6 *Field No. 6—Certification Status*—Were the test data certified by an expert body or individual to determine their applicability or appropriateness for a specific application? This may include a requirement that they be used to comply with performance requirements.

6.7 *Field No. 7—Completeness of Materials Description*—It is usually a necessity, when materials data are used for either design or materials selection, that auxiliary information be included with the data to indicate such information as material form and condition, processing history, the precise history of the material, etc. These descriptors indicate to the potential user the nature of the listed properties and their applicability.

6.8 *Field No. 8—Completeness of Test Procedure Description*—This descriptor does not indicate the actual test procedure used, but will indicate whether or not a standard test procedure (ASTM, DIN, etc.) was used to generate the data. It will also indicate if the data are taken from service experience (for example, long-term exposure to corrosive environments, neutron fluence, or complex loading conditions).

6.9 Field No. 9—Support:

6.9.1 Is the database actively supported with help services for users and maintained to keep it current? Examples of most common types of support include:

6.9.1.1 Hot-line user help system available,

³ Military Handbook—Metallic Materials and Elements for Aerospace Vehicle Structures. Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 1 Quality Indicators

Field Number	Field Title	Field Values
1	Source of data	U – Unpublished report J – Journal publication H – Handbook publication G – Government report P – Producer brochure S – Source unknown
2	Statistical basis of data	A – 95 % confidence that 99 % of values will equal or exceed value B – 95 % confidence that 90 % of values will equal or exceed value S – Specification limit values D – Combination of A, B and S values C – Other statistical basis T – Theoretical value P – Predicted value I – Interpolated value E – Extrapolated value M – Mean or average values N – Nominal or typical values U – Unprocessed single point test values; raw data X – Unknown
3	Material development/production status	P – Production material R – Experimental material O – Obsolete, no longer in production
4	Validation status	S – Validated at source V – Validated independently N – Not validated
5	Evaluation status	S – Evaluated at source E – Evaluated independently N – Not evaluated
6	Certification status	C – Certified N – Not certified
7	Completeness of materials information	F – Full information on material form, condition and processing history C – Information on material form and condition only X – No information on form, condition or processing history
8	Completeness of test procedure description	S – Standard tests; documented N – Nonstandard tests, documented E – Service experience data X – Test procedure(s) not documented
9	Database supported?	F – Fully supported P – Partial support N – No significant support