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Standard Guide for Formatting and Use of Material and Chemical Property Data and Database Quality Indicators[1]

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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 Systems[2]

E 1407 Guide for Materials Database Management[2]

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

[1] This guide is under the jurisdiction of ASTM Committee E-49 on Computerization of Material and Chemical Property Data and is the direct responsibility of Subcommittee E49.05 on Data and Database Quality.

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