



Standard Practice for Verification and Use of Control Charts in Spectrochemical Analysis¹

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1. Scope

1.1 This practice covers procedures for determining if a spectrochemical analysis is under statistical control.

1.2 Criteria are presented for determining when corrective action is required.

1.3 Control will be effected by using verifiers to test instrument response. It is recommended, although not required, that this be accompanied by the plotting of control charts.

1.4 The preparation of control charts is described.

1.5 *Limitations*—The procedures that are described do not apply to analyses that require a calibration each time a set of analyses is run. Reference is made specifically to atomic emission spectrometry, but the practice has a more general application.

1.6 This practice does not apply to validation procedures that monitor the correctness of calibration.

2. Referenced Documents

2.1 ASTM Standards:²

E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials

E158 Practice for Fundamental Calculations to Convert Intensities into Concentrations in Optical Emission Spectrochemical Analysis (Withdrawn 2004)³

E305 Practice for Establishing and Controlling Atomic Emission Spectrochemical Analytical Curves

E456 Terminology Relating to Quality and Statistics

E876 Practice for Use of Statistics in the Evaluation of Spectrometric Data (Withdrawn 2003)³

¹ This practice is under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.22 on Laboratory Quality.

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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.

³ The last approved version of this historical standard is referenced on www.astm.org.

2.2 Other ASTM Documents:

MNL 7A Manual on Presentation of Data and Control Chart Analysis⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to Terminologies **E135** and **E456** and Practice **E876**. Refer also to the glossary of terms and symbols appearing in MNL 7A.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *control limits*—in control charts, the upper and lower limits of a statistic that are not expected to be exceeded, designated as UCL and LCL respectively in this practice. For the statistic that is the average of more than one reading or determination, the upper and lower limits will be equidistant from a central line (CL) representing the expected average. For the statistic of either standard deviation or range, the upper limit will be farther from the central line if the lower limit is zero.

3.2.2 *normalization*—a procedure for correcting readings to a common basis. A special case of normalization is standardization in which readings are made to conform to an existing calibration. Normalization permits gathering data in different periods of time and correcting for drift in a way that may be independent of standardization routines.

3.2.3 *variation*—difference in an observed value from an accepted value.

3.2.3.1 *assignable cause*—variation which can be identified and corrected. It may be the result of a condition of an instrument or a method of operation. For example, signal intensities may be affected because a spectrometer is not profiled properly.

3.2.3.2 *chance or common cause*—random variation which consistently affects a system, contributing to the imprecision in a predictable way. In the application of control charts, the assumption is made that chance causes of variation are normally distributed.

⁴ ASTM Manual Series, ASTM, 7th edition, 2002.