



Designation: D4375 – 96 (Reapproved 2011)

Standard Practice for Basic Statistics in Committee D19 on Water¹

This standard is issued under the fixed designation D4375; 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 a uniform standard for calculating, expressing, and symbolizing some basic statistical parameters.

2. Referenced Documents

- 2.1 *ASTM Standards*:²
[D1129 Terminology Relating to Water](#)
[E456 Terminology Relating to Quality and Statistics](#)

3. Terminology

3.1 Definitions:

3.1.1 *population*—the set of data that consists of all possible observations or values of a certain phenomenon.

3.1.2 *sample*—a set of data from the population.

3.1.3 *statistic*—an estimated quantity for a parameter calculated from a sample.

3.1.4 *parameter*—a measurable quantity characteristic of a population.

3.1.5 *observation*—a fact duly noted and recorded.

3.1.6 *sample or population size*—(N may be finite or infinite, but N and n are finite for all calculations).

3.1.7 For definitions of related statistical terms, see Terminology [E456](#).

3.1.8 For definitions of other terms used in this practice, refer to Terminology [D1129](#).

3.2 Symbols for Sample and Population:

	Sample	Population
Observation	x_i	X_i
Sample or Population Size	n	N
Mean	\bar{x}	μ
Variance	s^2	σ^2
Standard Deviation	s	σ
Standard Deviation of Mean	$s_{\bar{x}}$	σ_{μ}
Relative Standard Deviation (%)	RSD	RSD _p

4. Summary of Practice

4.1 Prior to performing many statistical procedures certain variables need to be calculated. The technique for calculating these variables and presenting these results is developed in this practice.

5. Significance and Use

5.1 This practice assures the user that all calculations are performed in the same manner and that all results are presented consistently.

6. Calculation of Statistical Parameters

6.1 Mean:

$$\bar{x} = \sum_{i=1}^n x_i/n$$

$$\mu = \sum_{i=1}^N X_i/N$$

6.2 Variance:

$$s^2 = \sum_{i=1}^n (x_i - \bar{x})^2/n - 1$$

$$\sigma^2 = \sum_{i=1}^N (X_i - \mu)^2/N$$

6.3 Standard Deviation:

$$s = \sqrt{s^2}$$

$$\sigma = \sqrt{\sigma^2}$$

6.4 *Standard Deviation of the Mean*—(also known as standard error of the mean):

$$s_{\bar{x}} = \sqrt{s^2/n}$$

$$\sigma_{\mu} = \sqrt{\sigma^2/N}$$

¹ This practice is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.02 on Quality Systems, Specification, and Statistics.

Current edition approved May 1, 2011. Published June 2011. Originally approved in 1984. Last previous edition approved in 2006 as D4375 – 96 (2006). DOI: 10.1520/D4375-96R11.

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.