



Standard Practice for Calibration of Laboratory Volumetric Apparatus¹

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1. Scope

1.1 This practice covers procedures for use in the calibration of volumetric ware, in accordance with Specification E694 such as is in common use in chemical and clinical laboratories. It is based on the gravimetric determination of the quantity of water either contained or delivered, and the conversion of this value to true volume at the standard temperature of 20°C by means of suitable equations and standard tables. Calibration using mercury is excluded. Calibration may be performed using alternative gravimetric methodology, provided that it is demonstrated and documented that the results obtained are equivalent to those obtained using the methodology described herein.

1.2 This practice is intended to encompass capacity ware between the limits of 0.1 cm³ and 2000 cm³. Typical products falling within the purview of this practice are burets graduated “to deliver”, graduated cylinders, volumetric flasks, specific gravity flasks, measuring and dilution pipets, and transfer and capacity pipets.

1.3 The procedures are not recommended for calibration of apparatus with capacities below 0.1 cm³, such as microglassware.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E694 Specification for Laboratory Glass Volumetric Apparatus

¹ This practice is under the jurisdiction of ASTM Committee E41 on Laboratory Apparatus and is the direct responsibility of Subcommittee E41.01 on Apparatus.

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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. Summary of Practice

3.1 This practice is based upon a determination of the volume of water either contained in or delivered by the vessel. Procedures are given for cleaning, setting the meniscus, manipulating the apparatus, weighing, and converting the weight to the appropriate standard volume.

4. Significance and Use

4.1 The primary purpose of this practice is to provide uniform procedures that may be used to accurately calibrate a wide variety of volumetric ware. The techniques are simple in concept and can provide reliable results, provided the procedures are followed faithfully. Accordingly, the practice should provide a means for checking the original calibration of glassware and similar apparatus and for periodic rechecks as the need should arise.

4.2 Borosilicate volumetric glassware will hold its calibration indefinitely provided that it is not exposed to hydrofluoric acid, hot phosphoric acid, or strong, hot alkalis, and that it is not heated above 150°C when dry. A frosting of the glass surface (viewed when dry) indicates that chemical attack has occurred, and recalibration may be in order. As a precaution, however, it is recommended that the glassware be recalibrated after ten years of service regardless of its appearance.

4.3 Soda-lime volumetric glassware will become frosted with time because of attack from moisture in the atmosphere as well as from the chemicals mentioned above. In addition, it should not be heated above 90°C when dry. It is recommended, therefore, that it be recalibrated after five years of service unless frosting (viewed when dry) is observed sooner.

5. Units of Measurement

5.1 *Capacity*—The basic SI unit for volume is the cubic metre, m³. Due to its large size, it is rarely used in volumetric calibration. Rather, the cubic centimetre, cm³, is used and will be employed in this practice. The unit, millilitre, mL, may be considered as equivalent to the cubic centimetre.

5.2 *Standard Temperature*—Volumetric ware is almost universally calibrated at 20°C. The procedures described provide for such a calibration. When it is necessary to work at higher ambient temperatures, such as is the case in tropical countries, calibration may be required at the International Standards