



Standard Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature¹

This standard is issued under the fixed designation E 563; 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 covers a method of preparing, maintaining, and using a temperature reference bath of a mixture of shaved ice and water, saturated with air at a pressure of 101 325 Pa (1 atm).

1.2 An industrial practice for relating values referenced to the ice point and to the water triple point on the ITS-90 is included.

1.3 Methods to promote uniformity of bath temperature by mechanical stirring or agitation are not described in detail.

1.4 Methods of approximating the ice point, as by thermostatically-controlled refrigeration, are not covered by this practice.

1.5 *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:*

D 1193 Standard Specification for Reagent Water²

E 344 Terminology Relating to Thermometry and Hydrometry³

E 1594 Guide for Expression of Temperature³

3. Terminology

3.1 *Definitions*—Definitions given in Terminology E 344, unless otherwise defined herein, apply to terms as used in this practice.

3.2 Temperature relationships given in Guide E 1594, unless otherwise defined herein, apply to temperature values as used in this practice.

3.3 *Definitions of Terms Specific to This Standard:*

3.3.1 *ice-point bath, n*—physical system containing ice and water assembled to realize the ice point as a reference temperature, or to establish a constant temperature near 0°C.

4. Summary of Practice

4.1 The ice-point bath described by this practice consists of an intimate mixture, without voids, of pure shaved ice or ice particles and distilled air-saturated water in a thermally insulating vessel open to the atmosphere.

4.2 The ice bath realization of the ice point physically approximates, with small uncertainty, a natural fixed-point temperature.

4.2.1 An ice-point bath prepared using distilled-water ice and air-saturated, chilled distilled water, typically has a temperature of $0.000 \pm 0.002^\circ\text{C}$. Consequently, when the bath is used as a fixed-point temperature reference, the bath temperature is assumed to be 0°C, with an uncertainty that depends on the care with which the bath was established and maintained.

4.2.2 The ice-point bath is open to the atmosphere; the effect of barometric pressure on the ice point is -75 nK/Pa (-7.6 mK/atm). The solubility of air in the water is directly proportional to the atmospheric pressure.

4.3 The ice-bath temperature can also be measured with an accurately calibrated thermometer or compared to a water triple point cell and the bath temperature is reported as the measured temperature with an uncertainty that is attributed to the measurement, not to the ice point.

5. Significance and Use

5.1 This practice is adequate for use with other ASTM standards that specify the ice point as a reference. It is also intended to be adequate for most other ice-point reference purposes.

5.2 The ice point is a common practical industrial reference point of thermometry. The ice point is relatively simple to realize and provides a readily available natural fixed-point reference temperature.

5.3 *Use in Resistance Thermometry:*

5.3.1 The ice point was a defining fixed point on practical temperature scales prior to 1960.

¹ This practice is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.07 on Fundamentals in Thermometry.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 14.03.