



Designation: C1057 – 17

Standard Practice for Determination of Skin Contact Temperature from Heated Surfaces Using a Mathematical Model and Thermesthesiometer¹

This standard is issued under the fixed designation C1057; 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 procedure for evaluating the skin contact temperature for heated surfaces. Two complimentary procedures are presented. The first is a purely mathematical approximation that can be used during design or for worst case evaluation. The second method describes the thermesthesiometer, an instrument that analogues the human sensory mechanism and can be used only on operating systems.

NOTE 1—Both procedures listed herein are intended for use with Guide C1055. When used in conjunction with that guide, these procedures can determine the burn hazard potential for a heated surface.

1.2 A bibliography of human burn evaluation studies and surface hazard measurement is provided in the References at the end of Guide C1055. Thermesthesiometer and mathematical modeling references are provided in the References at the end of this practice (1-5).²

1.3 This practice addresses the skin contact temperature determination for passive heated surfaces only. The analysis procedures contained herein are not applicable to chemical, electrical, or other similar hazards that provide a heat generation source at the location of contact.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*³

C168 Terminology Relating to Thermal Insulation

C680 Practice for Estimate of the Heat Gain or Loss and the Surface Temperatures of Insulated Flat, Cylindrical, and Spherical Systems by Use of Computer Programs

C1055 Guide for Heated System Surface Conditions that Produce Contact Burn Injuries

3. Terminology

3.1 *Definitions*—Terminology C168 shall be considered as applicable to the terms used in this standard.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *acceptable contact time*—the limit of time of contact for the heated surface and the exposed skin. Practice has suggested limits of 5 s for industrial processes and up to 60 s for consumer items.

3.2.2 *burns:*

3.2.2.1 *first degree burn*—the reaction to an exposure where the intensity and duration is insufficient to cause complete necrosis of the epidermal layer. The normal response to this level of exposure is dilation of the superficial blood vessels (reddening of the skin).

3.2.2.2 *second degree burn*—the reaction to an exposure where the intensity and duration is sufficient to cause complete necrosis of the epidermis but no significant damage to the dermis. The normal response to this exposure is blistering of the epidermis.

3.2.2.3 *third degree burns*—the reaction to an exposure where significant dermal necrosis occurs. Significant dermal necrosis has been defined in the literature as a 75 % destruction

¹ This practice is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.30 on Thermal Measurement.

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² The boldface numbers in parentheses refer to the list of references at the end of this practice.

³ 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.