



Standard Practice for Chemical Permeation through Protective Clothing Materials: Testing Data Analysis by Use of a Computer Program¹

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1. Scope

1.1 This practice covers the calculations of all the permeation parameters related to Test Method **F739**, ISO 6529, and Practice **D6978** standards by use of a computer program, referred to as “Permeation Calculator” (DHHS (NIOSH) Publication No. 2007 – 143c).^{2,3}

1.2 The practice is applicable to both open loop and closed loop permeation tests. The closed loop test includes continuous sampling and discrete sampling. The discrete sampling includes tests when sample volume is replaced and also when sample volume is not replaced. For an open loop permeation test, the computer program also allows permeation data files with variable sampling flow rate. Refer to Test Method **F739** for more details about the different types of the permeation testing systems.

1.3 This practice is applicable to the most typical permeation behavior, that is, Type A, where the permeation rate stabilizes at a “steady-state” value. It does not apply to the other types of permeation behaviors. Refer to Test Method **F739** for more details about the various permeation behaviors.

1.4 This practice is not applicable to Test Method **F1383** because the permeation behavior is different under conditions of intermittent contact than under conditions of continuous contact.

1.5 This practice does not address the procedure of permeation testing. Refer to Test Method **F739**, ISO 6529, or Practice **D6978** for the procedures in detail if needed.

2. Referenced Documents

2.1 ASTM Standards:⁴

D6978 Practice for Assessment of Resistance of Medical Gloves to Permeation by Chemotherapy Drugs

F739 Test Method for Permeation of Liquids and Gases through Protective Clothing Materials under Conditions of Continuous Contact

F1194 Guide for Documenting the Results of Chemical Permeation Testing of Materials Used in Protective Clothing

F1383 Test Method for Permeation of Liquids and Gases through Protective Clothing Materials under Conditions of Intermittent Contact

F1494 Terminology Relating to Protective Clothing

2.2 ISO Standards:⁵

ISO 6529 Protective Clothing—Protection against Chemicals—Determination of Resistance of Protective Clothing Materials to Permeation by Liquids and Gases

3. Terminology

3.1 Definitions:

3.1.1 *analytical technique, n*—a procedure whereby the concentration of a challenge chemical in a collection medium is quantitatively determined.

3.1.1.1 *Discussion*—The detailed steps for these procedures are often specific to individual chemical and collection medium combinations. Applicable techniques include but are not limited to flame ionization, photo ionization, electro-chemical, and ultraviolet and infrared spectrophotometry, gas and liquid chromatography, colorimetry, length-of-stain detector tubes, and radionuclide tagging/detection counting.

3.1.2 *breakthrough detection time, n*—the elapsed time measured from the start of the test to the sampling time that immediately precedes the sampling time at which the test chemical is first detected.

¹ This practice is under the jurisdiction of ASTM Committee **F23** on Personal Protective Clothing and Equipment and is the direct responsibility of Subcommittee **F23.30** on Chemicals.

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² Gao P, Weise T, and Tomasovic B [2009] Development of a computer program for permeation testing data analysis. *Journal of Occupational & Environmental Hygiene*, 6(6): 363-373.

³ The computer program is available at no-charge either on the National Institute for Occupational Safety and Health website at

<http://www.cdc.gov/niosh/npptl/PermeationCalculator/permeationcalc.html> or on CD by request. Phone: 1-800-CDC-INFO (1-800-232-4636), Fax: 1-888-232-6348, or E-mail: CDCInfo@cdc.gov.

⁴ 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.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.