



Designation: F3031 – 17

Standard Practice for Range of Motion Evaluation of First Responder's Protective Ensembles¹

This standard is issued under the fixed designation F3031; 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.

INTRODUCTION

Protective ensembles such as firefighter turnout gear, HAZMAT suits, etc., may impose a negative ergonomic impact on the wearer. This impact may involve restriction of movement and overall discomfort to the wearer. The possible increased restrictions of mobility during the use of protective ensembles may result in injuries to the musculoskeletal system, decreased performance, and decreased comfort. It is up to the end user to decide the meaningfulness of the information provided with the use of this standard for the performance of his/her job. This ergonomic standard practice is to determine and report the range of motion (ROM) of the protective ensemble or base ensemble, or both, and has been designed to allow for comparisons of the ROM between ensembles of the same class (firefighter turnout gear) and from different classes (firefighter ensemble versus HAZMAT suit).

1. Scope

1.1 This practice specifies the test equipment and procedures for assessing ROM on subjects wearing a protective clothing ensemble.

1.2 This practice covers the ergonomic measurements of range of motion and subjective perceptions.

1.3 To increase safety during testing, this practice requires the use of human participants who meet specific health and physical fitness requirements.

1.4 This practice does not attempt to determine other clothing characteristics, such as thermal insulation and evaporative resistance of the protective clothing ensemble. Test Methods [F1291](#) and [F2370](#) can be used for these measurements.

1.5 The values stated in this standard shall be SI units.

1.6 It is the responsibility of the test laboratory to obtain the necessary and appropriate approval(s) required by their institution for conducting tests using human participants.

1.7 *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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.8 *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:*²

[F1291](#) Test Method for Measuring the Thermal Insulation of Clothing Using a Heated Manikin

[F1494](#) Terminology Relating to Protective Clothing

[F2370](#) Test Method for Measuring the Evaporative Resistance of Clothing Using a Sweating Manikin

2.2 *BSI Standards:*³

[BS EN 469](#) Protective Clothing for Firefighters – Performance Requirements for Protective Clothing for Firefighting

[BS 8469](#) Personal Protective Equipment for Firefighters – Assessment of Ergonomic Performance and Compatibility – Requirements and Test Methods

¹ This practice is under the jurisdiction of ASTM Committee [F23](#) on Personal Protective Clothing and Equipment and is the direct responsibility of Subcommittee [F23.60](#) on Human Factors.

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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 Available from British Standards Institution (BSI), 389 Chiswick High Rd., London W4 4AL, U.K., <http://www.bsigroup.com>.