

# Performance of Protective Clothing



**SIXTH VOLUME**

**Jeffrey O. Stull  
Arthur D. Schwope**  
EDITORS



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# ***Performance of Protective Clothing: Sixth Volume***

*Jeffrey O. Stull and Arthur D. Schwope, Editors*

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To make technical information available as quickly as possible, the peer-reviewed papers in this publication were prepared "camera-ready" as submitted by the authors.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

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## Foreword

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This publication, *Performance of Protective Clothing: Sixth Volume*, contains papers presented at the Sixth International Symposium on Performance of Protective Clothing: Emerging Protection Technologies held in Orlando, Florida on 18-19 June 1996. The symposium was sponsored by ASTM Committee F23 on Protective Clothing. Jeffrey O. Stull of International Personnel Protection, Inc. in Austin, Texas and Arthur D. Schwope of Arthur D. Little, Inc. in Cambridge, Massachusetts served as symposium cochairmen and also editors of the resulting publication.

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# Overview

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The Sixth International Symposium on the Performance of Protective Clothing and the publication of this STP marks the twentieth anniversary of ASTM Committee F23 on Protective Clothing. During the past two decades, ASTM Committee F23 has been a world focal point for improving worker health and safety through the advancement of best practices for protective clothing evaluation and use. At the committee, subcommittee, and task group levels, ASTM Committee F23, which is populated mostly by North Americans, promotes the free exchange and development of ideas and standards that are practical, yet never forgetting the well-being of the workers who must perform their jobs while wearing protective clothing and the employers who must pay for it.

ASTM Committee F23 recognizes the necessity of seeking out the leading-edge thinking of the larger, worldwide, protective clothing community. Consequently, ASTM Committee F23 convenes an international symposium every two to three years. Our sixth symposium was held in Orlando, Florida in June of 1996. The symposia have been highly successful. Perhaps more importantly, the set of proceedings books, which are published by ASTM as Standard Technical Publications (STPs), from our symposia represent the single most comprehensive collection of knowledge on the subject of protective clothing.

We have organized these proceedings into four areas of critical importance to the development and application of protective clothing:

- new procedures for testing materials,
- results of testing materials by established procedures,
- new methods for testing items of protective clothing, and
- results for testing items of protective clothing.

This organization recognizes the continuum of first understanding how the materials perform and then fabricating those materials into clothing that protect workers. The continuum also includes:

- the economics of clothing use,
- the effect of clothing on the worker's ability to perform his job,
- the attractiveness of the clothing to the wearer, and
- regulations, guidelines, and policies that govern the use of protective clothing.

These subject areas were not addressed at the sixth symposium but are critical to development and use of protective clothing. We strongly hope that and encourage the community to make these topics key themes of ASTM Committee F23's next symposium. After all, the use of protective clothing is a tradeoff among:

- protection;
- ability of the worker to function while wearing the clothing;



- likelihood that the worker will embrace the use of the clothing, in other words, elect to use the clothing and use it properly; and
- cost, the whole life cycle from purchase to training to disposal, and effects on worker productivity while wearing protective clothing.

Back to the content of these proceedings. Materials development and testing are fundamental to improvements in protective clothing. Without measuring and understanding the fundamentals, we cannot advance to implementation. Consequently, we consolidate at the beginning of this publication all papers that address materials test methods and the results of such testing. Within this heading, we have included the papers by subject area, for example, thermal protection, physical hazards, and biological hazards. These papers describe several novel techniques for measuring material performance or reassessing current test methods.

Next, we focus on the testing and performance of entire items of protective clothing. As evident from several of the papers, industry continues to make large strides forward in supplying clothing that provides protection and is durable to the challenges of diverse work environments. Several papers are presented that examine new ways to evaluate whole items.

Finally, we address the subject of comfort and human factors. To define and produce protective clothing items in which a worker is productive, efficient, and comfortable is industry's greatest challenge. These goals are also important to persons charged with selecting and recommending protective clothing. Again, how do we provide just enough but not too much protective clothing? The papers in this section provide insights intended to answer this question.

The papers in this STP have benefited from technical peer reviews by ASTM Committee F23 members and editorial improvement from the publications group at ASTM. We are certain that you will find information and insights that will aid you in your day-to-day activities. We also call your attention to the references associated with each paper. The references are the connection to the body of knowledge. There is richness in the references.

Finally, we would encourage you to communicate with the authors—by letter, telephone, and so forth. You will both learn something from the interaction. We know of no authors who would not be pleased to help you.

In summary, the community, which includes protective clothing specialists, industrial hygienists, human factors engineers, and others, has made great progress in the past 20 years. These proceedings represent only a sampling of the information available to you. We hope that your interest is stimulated and that you dig deeper into the field of your activity. If you are not already a member, we invite you to join ASTM Committee F23.

Much goes into organizing a symposium and its documentation into an STP. We acknowledge and extend our thanks to Steve Mawn, ASTM Committee F23's connection to ASTM, Shannon Wainwright and Peter Few of ASTM's publications group, and Ken St. John on the Committee on Publications.

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