

TECHNICAL REPORT

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Textiles — Design of apparel for reduced fire hazard

Textiles — Conception des vêtements pour la réduction des risques de feu



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 9240, which is a Technical Report of type 3, was prepared by Technical Committee ISO/TC 38, *Textiles*, Sub-Committee SC 19, *Burning behaviour of textiles and textile products*.

A bibliography is provided in annex A.

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Introduction

Garment style or design is an important contributing factor in the fire behaviour of apparel. As early as the 1890s, the hazards of long flowing dancers' dresses and naked-flame lights on theatre stages were reported in the United Kingdom.

As stated in referenced publications (see Bibliography, items 1. and 2.), the fire behaviour of garments is primarily affected by:

- a) the fibre content;
- b) the construction and mass per unit area of the material(s);
- c) the surface characteristics of the material; and
- d) the design of the garment.

However, it should be noted that the reaction of persons whose clothing is alight can have a significant effect on the burning behaviour of their garments.

Results of investigations into the burning behaviour of garments on manikins have been reported (see Bibliography, items 2., 3., 4. and 5.). In all cases the results show that under controlled conditions on a stationary subject, free flowing garments represented a greater hazard than less free flowing garments. The limited information from

case histories also indicates that accidents involving loosely fitting garments result in more serious burn injuries than those involving more tightly fitting garments. Of 641 accidents recorded, in which garments were directly ignited without flammable liquids or gases, 64% were of the dress/shift or loose top category. In addition, the burns resulting from accidents involving dress/shifts were more serious than those garments with "fire stops" such as belts (see Bibliography, item 6.).

Ignition occurred in most cases at the loosest area of the garments. Garments worn during burn accidents were classified according to fit at the point of ignition:

Loose 42%

Medium 24%

Tight 2%

Unknown 32% (see Bibliography, item 6.)

Buchbinder (see Bibliography, item 7.) also describes which case studies highlight the involvement of loosely fitting garments in fire accidents.

Additional information based on manikin trials shows that garment design is a sufficiently important factor in fire behaviour to be used as the basis for the designation of some garments as having a lower risk. This designation is used in addition to the usual one of low fire risk based on the burning behaviour of fabrics.