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Wool & Fire

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Fabrics & Flames

Burns from textile fires are a significant cause of injury and death. While most fibres used in textiles can burn, some are much more flammable than others, depending on the fibre content.

When a fire starts in a bedroom or living room where soft furnishings are the norm, fatality occurs in that same room more often than when the fire starts in any other room. Gas, smoke or toxic fumes are the most common cause of fatalities due to fires in home dwellings.

Given the right conditions, textiles of all fibres will burn.

Many factors influence how easily a textile will ignite, the manner in which it will burn, and the products of its combustion. These include the source of ignition and conditions such as airflow and surrounding materials. But the most important parameter in assessing the flammability of a textile is the fibre type.

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At the same time, providing textiles contain the right type of fibre, they can provide safety from burns, smoke and fume inhalation in key situations:

1. Children's sleepwear.
2. Clothing for emergency services personnel
3. Military apparel
4. Situations where there is potential for exposure to open flame or extreme heat

Flame Resistance

Wool's inherent chemical structure makes wool fibres naturally flame resistant. It is a highly trusted natural fibre in public areas such as hotels, aircraft and theatres as well as for clothing in form of base layers for fire fighters or military soldiers.

Of the commonly used textile fibres (cotton, rayon, polyester, acrylic and nylon), wool is widely recognised as the most flame resistant.

Table: Key measures of flammability for common textile fibres

FIBRE	LIMITING OXYGEN INDEX (%)	HEAT OF COMBUS-TION (KCAL/G)	IGNITION TEMP (°C)	MELTING TEMP (°C)
Wool	25.2	4.9	570-600	Does not melt
Cotton	18.4	3.9	255	Does not melt
Nylon	20.1	7.9	485-575	160-260
Polyester	20.6	5.7	485-560	252-292
Rayon	19.7	3.9	420	Does not melt

Source: CSIRO

Wool's inherent fire resistance comes from its naturally high nitrogen and water content. Because of this, wool requires higher levels of oxygen in the surrounding environment in order to burn.

Wool may be ignited if subjected to a significantly powerful heat source, but it does not normally support flame. If smouldering occurs, it usually continues only for a short time.

In addition, wool's highly cross-linked cell membrane structure will swell when heated to the point of combustion, forming an insulating layer that prevents the spread of flame.

Wearing Wool in High-Risk Situations

Soldiers, police and firemen have been relying on wool for many centuries due to the fibre's natural protective properties.

Today, those who work in high risk environments – such as astronauts, search and rescue teams, even Formula 1 drivers – benefit from wearing wool next to skin, reducing the risks associated with the danger of being exposed to flames.

Unlike synthetic base layer garments, wool base layers are more difficult to ignite, do not melt, nor stick to the skin and do not produce toxic fumes when exposed to high temperatures. All these factors can be vital for survival in an extreme situation.

About IWTO

With a world-wide membership encompassing the wool pipeline from sheep to shop, the International Wool Textile Organisation represents the interests of the global wool trade. By facilitating research and development and maintaining textile industry standards, IWTO ensures a sustainable future for wool.
To learn more about IWTO and its activities, visit www.iwto.org.

INTERNATIONAL WOOL TEXTILE ORGANISATION IWTO

Fire Statistics Great Britain 2011 to 2012 (December 2012) https://www.gov.uk/government/statistics/fire-statistics-great-britain-2011-to-2012 Accessed on 26/11/18

P E Ingham and M F Hnat, The Flammability Performance of Wool (January 2010)

S R Collie and N A G Johnson, The Benefits of wearing wool rather than manmade garments. WRONZ, Lincoln, Christchurch, New Zealand. (1998)

P E Ingham and R J Edwards. WRONZ Communication 88, WRONZ, Christchurch, New Zealand (January 1984).

New Zealand Merino Company Limited, Flammability Report.