Wool and Flame Resistance
Fact Sheet

Key Points
• Wool has a complex composition that is based on a unique cell structure
• Wool’s high nitrogen and water content makes it naturally flame resistant
• Wool does not ignite easily and will often self-extinguish
• Should wool burn it does not melt while burning
• Wool produces less smoke and toxic fumes during combustion than synthetic fibres, making it a far safer choice for interiors such as carpets and bedding

Why is flame resistance important?
Burns from clothing fires are a significant cause of injury and death. In some applications – children’s sleepwear, work wear for emergency services and military personnel, for example – it is crucial that textiles provide a level of safety from the risk of burns, smoke and fume inhalation.

What factors influence flammability?
There are four key aspects to burning behaviour:
1. Propensity for ignition.
2. Smoke density.
3. Toxicity of products evolved from burning.
4. Speed of flame spread.
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 fibre type.

What makes wool so fire resistant?
Of the commonly used textile fibres (cotton, rayon, polyester, acrylic and nylon), wool is widely recognised as the most flame resistant. Wool’s fire resistant attributes include:
• A very high ignition temperature – 570-600° C
• A high Limiting Oxygen Index (LOI). (the measure of the oxygen level needed to sustain combustion)

What determines a fibre’s flammability?
The Limiting Oxygen Index test is used to rank the flammability of materials. The higher the value LOI, the less flammable the material.
Wool has the highest LOI of the commonly used textile fibres.

**What are the advantages for wool carpets?**
Wool’s superiority in carpets is due not only to its inherently lower flammability, but its tendency to char on the surface pile. The charred layer protects the carpet’s lower pile, backing, and underlay. The protective effect of wool pile can be seen in the unchanged Critical Radiant Flux (CRF), which is the minimum radiant energy a fire needs to sustain burning. The lower the CRF the greater the tendency of the material to spread flame. Even with a non-wool underlay, a wool carpet maintains its CRF. In contrast the CRF of nylon and polypropylene carpets drop significantly as they begin to melt. This also results in greater smoke levels when other fibres are present in the form of sheets and bed linens, wool significantly reduces the rate of fire development and flame spread and consequently provides a much longer potential escape period. For example, with a polyester duvet, a fairly frightening fire will develop within three-four minutes after ignition, and four minutes later, the fire will be difficult to extinguish. In contrast, a wool blanket or wool duvet permits only a slow spread of flame, low heat output and relatively little smoke even over a much longer period.

**What about bedding? How can wool help when bed linens are made of cotton and polyester?**
There are major advantages in incorporating a wool component into a bedding system. Even

**Where can I learn more?**
For more information about wool and its natural properties, contact:
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**About IWTO**
The International Wool Textile Organisation (IWTO) is an independent non-profit organisation representing the wool industry at the international level. Our mission is to connect all parts of the wool supply chain in order to strengthen wool’s credentials as the world’s leading sustainable fibre.

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