

At the cutting edge: clothing leathers

There are two quite different outlets for leather clothing, where, in addition to good tensile strength and resistance to tearing, very specific properties for protection are required. One area of use requires high protection against abrasion, the other a high level of heat and flame resistance.

The needs of motor cycle leathers

Motorcycle garments need the combination of a high quality fabric and good design to provide the maximum level of safety. This includes the inclusion of hard foams of different densities for limb, elbow, knee, hip, thigh, and back protection against impact, but these do not influence the leather properties as the garment is brought together.

There are three main areas where exacting needs apply:

IMPACT ABRASION

Impact abrasion is tested by wrapping a sample of the clothing leather around an anvil, then dropping onto a moving abraded surface as shown in *Figure 2*.

The belt surface can move at different speeds, and the performance is measured by how long it takes before the leather is abraded through. Leather provides particularly good protection and outperforms most materials.

IMPACT CUT

Basically a blade under increasing load is dropped onto a leather until penetration as shown in *Figure 3*. This measures the resistance to sharp objects such as splintered glass, broken bottles, sharp stones etc.

BURST STRENGTH

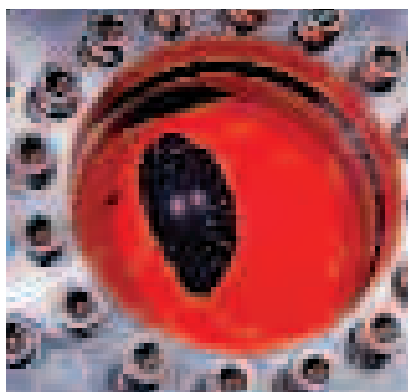
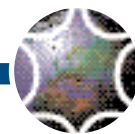
Normally the burst strength of a fabric is measured by a two-dimensional load tear, but as clothing and limbs are three-dimensional, this test needs to be multi-dimensional. In addition, the garment must provide complete protection;



Figure 2: The impact abrasion test.



Figure 3: Applying the impact cut test to leather.



Figures 4 & 5: The burst strength test is used to assess both leathers and garments with particular attention to seams.



Figure 6

therefore not only the leather must be tested, but also the seams. Conventional seams are not strong enough, so in motorcycle leathers the seams are more complex and overlapped. The load is applied to both leathers and garment test parts using a mandrel until tear as shown on *Figures 4 & 5*.

Resistance to heat and assessment of flammability

Inherent heat and flame resistant properties are needed, for example, in welder's protective clothing, where matters concerning the leather are:

- Does the leather continue to flame after an ignition source has been removed?
- What are the effects of items such as molten metal?
- How much heat is transferred?

Leathers can be tested for protection against these risks using standard test methods, such as the impact of molten metal drops. In this test at least 15 drops of molten metal need dropping on the leather to raise the temperature behind the test piece by 40°C (*Figure 6*).

Other tests involving exposure to radiant heat (see "At the cutting edge: Gloving leather" *World Leather* June/July 2004) might be included for dry heat applications such as kiln uses.

Protection, however, is not simply a function of the leather, but includes garment design. For example, poor design might allow pockets to form that could hold molten metal. There are therefore two issues: are the materials good enough, and is the ergonomic design correct.

In this situation, flammability cannot be simply assessed by using test samples. Suitability therefore involves testing the complete garment, and is assessed using severe test conditions. This involves a manikin dressed in the protective garment subjected to heat in the form of gas jets as shown in *Figures 7 & 8*.

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Figures 7 & 8: Flammability testing of clothing.