



At the cutting edge: gloving leathers

There are three main areas where special properties are demanded of gloving leathers. Test methods provide detailed guidance through the various procedures, and these methods are applied either to the materials used in construction, or the complete glove.

1. General industrial gloving

Commonly termed "Riggers Gloves" this specification applies to builder's, labourer's, and general work gloves. The leathers used are mainly provided by chrome splits, off-cuts from upholstery leathers, and sometimes suedes.

The properties required are abrasion resistance, cut resistance, tear resistance and puncture resistance, and these tests are illustrated in photographs 1, 2, 3 & 4.

With these tests the leathers do not pass or fail, but are given performance levels. This is because certain samples may have, say, a good abrasion resistance but poor cut values; leather with an open fibre structure might provide poor puncture resistance but give greater comfort. An improvement in one property will thus affect the others, so the choice is given to the customer. The general classification levels are given in *Table 1*, but it should also be remembered that the glove design can strongly influence the test findings.

Table 1: Minimum requirement levels central for gloving requirements

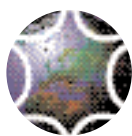
Test	Level 1	Level 2	Level 3	Level 4	Level 5
Abrasion resistance (number of cycles)	100	500	2000	8000	>
Blade Cut resistance (Index)	1-2	2-5	5	10	20
Tear resistance (Newton)	10	25	50	75	>
Puncture resistance (Newton)	20	60	100	150	>



1. The Martindale test, where the outer surface of the mounted leather samples is subjected to abrasive disks under load, being moving in a frame in an engineered configuration.



2. The blade cutting test where the performance is assessed by subjecting the samples to a circular blade under load moving backwards and forward across the sample (under inspection) until penetration is achieved.



3. Tear resistance, where the load required to tear the leather is measured using the Instron Tensile Strength machine.



4. Puncture resistance is measured by dropping a spike under increasing load onto the mounted sample until penetration is achieved.



5. The standard flame is applied to the complete glove. Performance is assessed by measuring the time that the glove continues to burn, and the time of after glow.

2. Fire fighters' gloves

Although leather provides excellent general properties, it is often used in combination with other fabrics to meet the highest standards. For example, if dexterity is specified then suede leather might be used, the lowering in cut resistance can be offset by using a knitted or woven Kevlar-type cut resistant lining. In addition, the leather might be water resistant, but fitted with a waterproof breathable membrane.

The tests used are those that apply to general gloving, but with increased performance levels coupled with heat and flame resistance e.g. burning behaviour as shown under test in *Photograph 5*.

In this test the after-flame time must be less than two seconds, and the after-glow time less than five seconds. Other tests can be applied to the back and palm of the complete glove for resistance to convective heat, to radiant heat, and heat shrinkage of the whole glove to avoid hand entrapment.

If required the leather can be tested for resistance to water penetration using the Bally penetrometer, with performance levels given according to the time required for water penetration.

In addition, test methods and standards are available for resistance to the penetration and uptake of solutions of sulfuric acid and hydrochloric acid, sodium hydroxide solution and solvents.

Another key requirement is a need for dexterity as radios and other small pieces of equipment need operating under difficult conditions. The leather therefore needs to be soft, meaning that there is often a trade off with another high performance feature. The need for compromise is highlighted by the fact that a high percentage of hand injuries occur when gloves have been removed because of a lack of dexterity.

Dexterity is also required in other areas such as police forces to enable fixing handcuffs or operate mobile phones, and handling CS2 spray containers or firearms. Where the ergonomics must be orientated to real life, the question "what is required" must be raised, and "can this be achieved with this glove?"

The extreme is the anti-syringe glove for protection against a hypodermic needle. In this situation a high level of abrasion is sought in addition to general properties. The puncture resistance is however insufficient, and might only be raised by very fine steel mesh linings. This is another example of trade-off between

an acceptable level of dexterity while providing a reasonable degree of protection.

3. Protection against thermal risks

Where gloves are required for protection against thermal risks, the general standards are required but with emphasis on abrasion, cut and tear resistance properties. Tests are then selected as relevant to the end use, such as resistance to burning, contact, convective and radiant heat as required for fire fighters



6. Dexterity is evaluated by picking up pins while wearing gloves.



7. Molten metal tests are used to ensure protection against thermal risks.

gloves. Gloves intended to be used by foundry workers and welders must also be tested for resistance to both small splashes and large quantities of molten metal (*Photograph 7*).

Standards apply within other areas where the wearer is subjected to dry heat, such as use in pottery kilns, but also for insulation and protection against cold conditions, such as experienced when handling goods within freezer units (*Photograph 8*). 



8. Hands need insulation against continuous exposure to cold conditions such as those found in the catering industry.

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