



PART 2

TEST METHOD FOR DETERMINATION OF IMPACT ABRASION RESISTANCE

During the development of this standard, a number of existing test methods were proposed and discussed. Some were found not to be suitable for testing certain of the textile materials increasingly in use in motorcyclists' clothing, and the final choice came between the "Darmstadt" machine (which is used by several textile weavers and motorcycle clothing manufacturers; notably Schoeller, BMW and Alpinestars) and the "Cambridge" machine conceived and built by Dr Roderick Woods of the Protective Clothing Research Facility (PCRF) at Cambridge University.

Both machines were uniquely developed for the testing of motorcycle clothing, but employ distinctly different criteria to assess clothing materials. The Darmstadt machine consists of a "doughnut" of concrete, with a rotary system emerging from the centre from which one or more sample holders are suspended. An electric motor spins the sample holders to a specific number of revolutions per minute and then the sample holders unlock from the central shaft, fall onto the concrete and continue to spin whilst gradually coming to rest. The test sample is judged on the basis of the difference between its mass prior to and subsequent to testing.

Supporters of the method claim that it more accurately mimics the action of clothing in a real accident; a reduction in speed from initial velocity to a halt. Critics claim that the constitution and abrasiveness of the concrete cannot be adequately controlled, that the surface condition changes as debris from the previous "sweep" of the sample holders, further affecting results, but most seriously that this method approves materials which are known to be wholly unsuited to use in motorcyclists' protective clothing; for example sheep nappa.

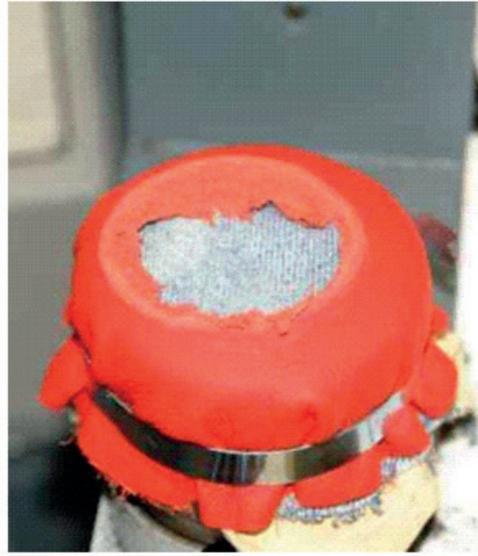
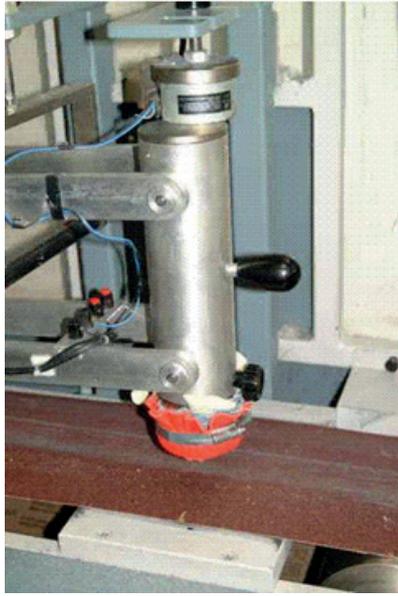
Despite these criticisms, the Darmstadt machine initially found favour within the standards committee - possibly because the machine was already in use in industry and there was reluctance to invest in another device! Darmstadt University were given every opportunity to address the areas of technical concern that had been levelled at their device, but failed to respond. Consequently it was decided to write the standard around the Cambridge machine.

The Cambridge machine has been used to develop, test and certify every leather and textile product to be subject of EC Type-Examination and bearing CE marking. At least three have been built: at PCRF, SATRA Safety Product Centre and the device used for many years by RiDE magazine for its clothing tests. Picture 2 shows SATRA's test machine.



Picture 2: SATRA's EN 13595 "Cambridge-type" impact abrasion apparatus

A heavy duty abrasive belt of known grit value and manufactured to a standard, spins at a constant speed of eight metres per second, or just under 18 miles per hour. The test specimen of garment material is mounted on a hinged arm that is released and falls onto the moving belt. A fine copper wire fixed across the surface of the specimen is cut and starts an electronic timer. The test continues until the sample is abraded through, whereupon a second copper wire is cut and stops the timer and the time taken from contact to perforation is recorded. The minimum times for each of the zones are stipulated in Part 1. Picture 3 shows an impact abrasion test in progress and Picture 4 shows an abraded test specimen.



Picture 3 (left): Impact abrasion test in progress

Picture 4 (right): Abraded test specimen

Brushes and a vacuum debris removal system ensure the surface of the abrasive belt is continually cleaned. The method tiers materials according to a hierarchy supported by anecdotal evidence. Leather, textiles (wovens and knitteds, including aramids) and plastics can all be evaluated. The device has also been adopted for use in other standards where there is a requirement for products to be tested for their abrasion resistance against road surfaces, such as roller skating protectors. Figure 2 provides a schematic of the apparatus.

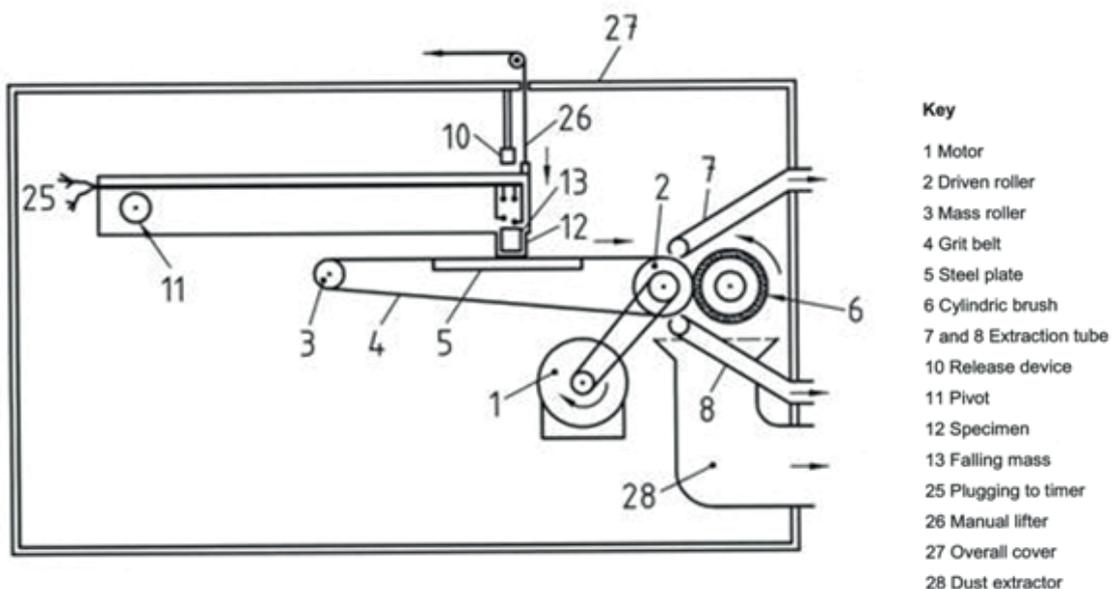


Figure 2 - A schematic of the EN 13595 "Cambridge" type impact abrasion apparatus