

Chair testing for product development

by Peter Westley

Furniture

Chair testing data can assist the design process, help improve manufacturing techniques and materials and provide evidence of due diligence for manufacturers' new and current models.



In the UK, the Royal Society for the Prevention of Accidents (RoSPA) documented (Home and Leisure Accident Surveillance System – Annual Reports 2002) that during 2002 (the most recent figures available) there were 7,326 reported accidents involving chairs or seats in the home and 1,904 reported accidents involving chairs or seats in the leisure environment. Whilst furniture may not always have actually caused the accidents, the figures do highlight the importance of personal safety when everyday furniture items are in use.

Making and selling chairs that are safe and fit for the intended purpose is a priority in the highly competitive chair manufacturing market. The need to demonstrate adequate safety and

appropriate 'fitness for purpose' has become increasingly important with many buyers of domestic, contract and office products insisting on seeing evidence of product safety.

Where a multitude of designs and styles are available for a variety of applications, the supplier and buyer alike should be aware of producing the right product for the application. A chair suitable for light domestic use will not last long in a busy call centre environment and could even be potentially dangerous to the user if the product does not have the appropriate structural strength and durability.

Making the right choice

A chair designer should have a clear remit as to the end use of any new product. He or she must be able to decide which materials, construction and dimensions to use in terms of the required strength, durability, stability, ergonomics, function, intended conditions of use, legislation, tactility and aesthetics. The designer must account for ease and cost of manufacture as well as the intended price bracket for the market in which it is to be sold.

The chair should be tested using standardised methods that provide vital data about its potential capabilities in a given environment. This data can be used as part of the design process, for improvements to manufacturing techniques and materials and, most importantly, as evidence to show 'due diligence' when placing a new product on the market or verifying the continued fitness for purpose of a current product.

Fitness for purpose

There are two distinct types of furniture market and therefore two main testing levels – contract and domestic.

Contract chairs in the UK and Europe

User guidelines for office chairs.

Safety guidelines that could be passed onto the user of office chairs:

- Do not lean back in office chairs, particularly swivel chairs with castors or wheels.
- Never climb on a chair. Use an approved ladder or stepstool.
- Office desk chairs should have adjustable back supports and seat height. Make sure that your chair's back support position and seat height are comfortable.
- Take care when sitting in a chair with castors or wheels. Make sure it does not roll out from under you when you sit down.
- Repair or report any chair damage that could be hazardous.
- Do not roll chairs over electrical cords.

are almost always subjected to extensive testing, as this is usually a requirement of the purchasers of such furniture. For example, office furniture is in use for up to 12 hours a day and therefore has to be durable and meet demanding dimensional stability criteria. The situation is similar for contract furniture used in UK hospitals, hotels and schools, where specific standards are required to meet severe wear and tear.

Chairs for the domestic market are likely to incur much less sustained stress because most of their use is concentrated at evenings and weekends. However, potential use and abuse by children and the elderly ensures that, although not continuous, stress levels on materials and components can be high. Therefore, it is still important to be sure of a given chair's limitations in these environments.

Development testing

The current BS 5459:2000 test for fatigue

of office pedestal chairs requires testing at less than six cycles per minute, so as not to generate excess heat, which can give a total test time of between 10-12 weeks. This 'fatigue' element of the tests is used to ensure the product is likely to be safe while in service. But this does not help the furniture designer who wants to prove their project in the shortest possible time. SATRA listened to this requirement and, as a result of extensive laboratory work and user trials, a much quicker method was developed by applying tests to the chair clutch mechanism. This route was taken because our analysis of failures highlighted the fact that the clutch mechanism was the component most likely to fail quickly in service.

The result is a reduction in turnaround time per test to a matter of a few days. The SATRA test method is fully correlated to the conditions of use and the current British and European standards in place, but is available for companies to use as a quick and efficient development tool, providing an accelerated test for chairs. This is achieved by using a machine that can test up to six pedestal chair mechanisms simultaneously.

SATRA has a large number of, automatic chair testing machines which operate 24/7 – this gives quick response and short lead times for testing domestic and contract seating. Our chair test machines have been specially designed by SATRA engineers to meet customer expectations with regard to accuracy and reproducibility. Special control software has also been created to ensure safe, accurate and repeatable operation. Using load cells, computer-controlled force regulators and sensitive limit devices, the machines are capable of applying both static and fatigue loads to an accuracy of +/- 5 per cent. This consistency during the testing cycle is important to existing SATRA customers and continues to attract new business. The machines are calibrated using independent load cells and recording equipment. All machines are used and operated within the scope and parameters of our United Kingdom Accreditation Service (UKAS) ISO 17025 testing accreditation.

Where relevant testing is carried out, to current British or European Standards, test results are often used by chair manufacturers to help with the promotion of their products. Buyers of seating for retail or contract markets often request testing before they buy, to ensure it is fit for purpose.

SATRA chair testing.

Type of chair	Applicable standard
Pedestal chairs a) Domestic b) Contract	BS 4875:Part 1:2001 / BS 1022:2005 BS 5459:Part 2:2000 (24hr use up to 150kg) or EN 1335:2000 (8hr use up to 110kg)
Office chairs (four legged) a) Domestic b) Contract	BS 4875:Part 1:2001 (Test Level 1-3) / BS 1022:2005 BS 4875:Part 1:2001 (Test Level 4-5) / BS 7945:1999
Visitor chairs (contract)	EN 13761:2002 / BS 7945:1999
Dining/easy chairs a) Domestic b) Contract	BS 4875:Part 1:2001 (Test Level 1-3) / BS 1022:2005 BS 4875:Part 1:2001 (Test Level 4-5) / BS 7945:1999
Outdoor use chairs Camping, domestic and contract	EN 581:Part 1:2006 / DD ENV 581:Part 2:2000 / EN 581:Part 3:1999
Reclining chairs a) Domestic b) Contract	As per dining/easy chairs plus DD ENV 12520:2000 As per dining/easy chairs plus DD ENV 12520:2000

How can SATRA help?

For further information on SATRA's chair testing service for buyers or sellers, please contact John Shipman (johns@satra.co.uk).