



SAFETY, PERFORMANCE AND ENVIRONMENTAL TESTING OF COMMERCIAL AND RESIDENTIAL FURNITURE





Safety, Performance and Environmental Testing of Commercial and Residential Furniture

From the earliest stone seats and beds used by non-nomadic cultures some 5,000 years ago to today's advanced designs that are functional, comfortable and aesthetically attractive, furniture is an essential part of the human experience. Furniture contributes to the functionality and usefulness of every inhabited space, including commercial and institutional settings, residential environments and retail establishments, as well as outdoor recreational areas. As general living standards continue to improve for billions of people around the world, the global demand for furniture and furniture products is expected to experience continued strong growth, and provide important business opportunities for furniture manufacturers.¹

However, to effectively capitalize on these market opportunities, furniture manufacturers today are required to meet a broad set of compliance challenges that may include safety, product performance and environmental considerations to gain market acceptance. Specific compliance issues may include performance and mechanical requirements, flammability, exposure to potentially harmful chemicals, and product safety. Furniture products intended for specific user groups such as children are often subject to additional testing and evaluation. And specific procurement requirements and buyer expectations may further add to the testing and assessment that furniture manufacturers must address.

This UL white paper provides a summary of the types of product testing and assessment applicable to manufacturers of various types of furniture products, including furniture intended for use in commercial, institutional, retail and residential settings. It begins with a review of the state of the furniture industry today, and provides an overview of the various types of furniture products subject to testing. It then summarizes the specific testing required under current regulations, along with the applicable standards and testing procedures. It concludes with some recommendations for furniture manufacturers on effectively managing product testing requirements.





The Global Furniture Industry Today

The global furniture industry is a leading source of economic activity in advanced and emerging economies alike. According to research by the Centre for Industrial Studies,² nearly \$450 billion of furniture is produced annually. Seventy different countries account for the majority of this production, with China, the U.S., Italy and Germany as the leading furniture-producing countries.

Emerging furniture-producing countries are driving global growth in furniture production. Between 2002 and 2012, furniture production grew an average of 18 percent annually in countries including India, Poland, Brazil, Russia, Turkey, Vietnam and Malaysia, compared with just 1 percent growth in advanced economies. In addition, around 30 percent of the top 200 furniture manufacturers are based in emerging furniture-producing countries. Above average production growth in emerging furniture-producing countries is expected to continue, resulting from increased local demand and continuous efforts to lower production costs.

Furniture production is also an important source of employment for millions of workers. In the U.S. alone, more than 350,000 workers are engaged in furniture and related product manufacturing,³ with an additional 450,000 involved in the sale of furniture products through retail stores.⁴ This data helps illustrate the size and strength of the furniture industry as well as its contribution to the overall economic health of furniture-producing countries.

Types of Furniture Subject to Product Testing or Assessment

The furniture industry produces a wide range of products used in commercial and residential settings. The major categories of furniture include:

- **Office furniture** – Furniture intended for use in office environments includes work desks, conference tables and seating, but can also include filing and storage units. Advanced workstation modular systems include divider and privacy panels and work surfaces as well as electrical and networking components and accessories that provide office occupants with lighting, communications and networking capabilities.
- **Household furniture** – Household furniture is perhaps the broadest category of furniture products, and includes wooden and upholstered furniture, as well as kitchen and bathroom cabinetry. Textiles and other upholstery materials are often incorporated into household furniture products for comfort or aesthetic reasons. In addition, paints, varnishes, coatings and other finishes are typically applied to furniture surfaces to improve appearance and durability. Some furniture products may include electrical wiring and components to support accessory lighting or to allow for easier manipulation or adjustment by consumers.
- **Bedding and mattresses** – Bedding and mattresses represent a

subcategory of furniture that includes mattresses, mattress foundations and bedding ensembles. Bedding and mattresses may also be incorporated into household furniture products such as sofas to increase their utility. They can include electrical wiring and components to facilitate adjustments to positioning or comfort settings.

- **Children's furniture** – Children's furniture products are typically designed to address the unique requirements of their intended users, and to minimize specific health and safety risks. Furniture intended for use by children includes beds, such as cribs, bunk beds and mattresses. Dressers, case goods, and other furniture components and accessories may also be used in children's rooms, but may not be subject to all regulatory requirements. As with other household furniture products, children's furniture may incorporate upholstery or textiles, and be finished with paints, varnishes and protective coatings.
- **Commercial displays and retail furniture** – Furniture and furnishings are also produced for the specialized requirements of commercial displays for retail settings. These products can include product displays and furnishings as well as cabinets and display fixtures with integrated wiring for lighting or electronics.



Types of Furniture Testing and Assessments

The scope of testing and conformity assessment applicable to a specific furniture product is determined by a number of factors, and can vary significantly from product to product. However, there are several important types of testing to which most furniture products are subjected. The following sections describe each of these tests in greater detail.

Product Performance

Performance testing is intended to evaluate a furniture product's ability to withstand wear and tear under normal, anticipated use. While not directly related to safety considerations, performance testing is often an essential process in a manufacturer's own quality system evaluation or required as a condition of procurement by a retailer. Product performance tests can include:

- **Surface testing** – Surface tests assess a furniture product's resistance to water or cleaning products as well as scratches or abrasion.
- **Fast aging testing** – Fast aging tests assess a product's resistance over time to the effects of light or heat.
- **Packaging suitability** – Furniture product packaging testing uses drop and vibration testing and can include evaluations for packing carton construction and bursting strength.

Mechanical Testing

Mechanical testing is intended to evaluate the mechanical aspects of a furniture product and to identify product aspects that could lead to mechanical failure, thereby posing a potential safety risk to consumers. While not a specific regulatory requirement, mechanical testing can demonstrate a manufacturer's commitment to safety and provide a defense against claims of unsafe products. Specific types of mechanical testing can include:

- **Structural testing** – Structural tests can assess a furniture product's static and dynamic load-handling ability, deflection characteristics, swivel duration, and general strength and stability.
- **Component testing** – Component testing evaluates the strength and duration of furniture product components such as chair frames, hinges, door locks and drawer guides.
- **Mechanical safety** – Mechanical safety testing assesses risks associated with sharp points and edges, and potential areas for unintended squeezing, hearing, or entrapment of fingers and their human appendages.

Electrical Safety

Many modern furniture products incorporate electrical or electronic components to provide illumination or to facilitate the operation or control of specific product features. As such, these products are subject to mandatory testing

for electrical safety in most jurisdictions. The goal of electrical safety testing is to identify potential electrical hazards, and to evaluate how a product's design or construction eliminates or minimizes the risk of fire or shock. Testing for electrical safety is typically conducted in accordance with the requirements of those standards applicable to specific categories of furniture products.

Flammability

Furniture products are usually composed of materials that are potentially flammable, such as wood and upholstery fabrics, adhesives, paints and varnishes. As a result, furniture products can serve as a primary ignition point or fuel source for indoor fires. For these reasons, most jurisdictions require flammability testing for fabrics and upholstered furnishings. Flammability testing evaluates the suitability of materials for use in furniture products by assessing their resistance to the effects of heat or flame as well as their burn and heat release characteristics. Specific types of flammability testing can include:

- **Ignition testing** – Ignition testing determines a furniture material's resistance to ignition when exposed to heat or open flame. Resistance is measured by the time that elapses between initial exposure and ignition. Materials with greater resistance are less likely to ignite under foreseeable hazards.
- **Flame spread testing** – Flame spread testing evaluates the speed at which fire spreads from first



ignition. Ideally, materials suitable for furniture burn more slowly than other materials, thereby retarding the spread of fire and providing building occupants with additional escape time.

- **Heat-release characterization** – The heat released from burning furniture can adversely impact ambient temperature conditions in a fire and contribute to flashover. Heat-release characterization assesses the amount of heat build-up contributed by burning furniture.

Chemical Content and Chemical Emissions

The use of chemicals in furniture and the control of chemical emissions from furniture products are tightly regulated in most jurisdictions worldwide. European Union (EU) Regulation (EC) No. 1907/2006, also known as the REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) Regulation, is applicable to most chemicals and chemical containing products manufactured, imported or sold in the EU. In the U.S., the Consumer Product Safety Improvement Act (CPSIA) bans or significantly restricts the use of certain chemicals in products intended for use by children. In the state of California, manufacturers are required to label those products that contain potentially toxic substances that exceed acceptable exposure levels under that state's Safe Drinking Water and Toxic Enforcement Act (also known as Proposition 65). Types of chemical testing include:

- **Chemical content testing** – Chemical and microbiological

content testing is often used to evaluate the presence of heavy metals, biocidal agents, phthalates, flame retardants, and other chemicals and substances whose use may be restricted or banned.

- **Chemical emissions testing** – Some chemical substances found in furniture products, such as VOCs and formaldehyde, are released from furniture products over time. Because these emissions can contribute to poor indoor air quality, chemical emissions testing or assessment may be a condition for achieving environmentally preferable product certifications or a procurement requirement.

Environmental Sustainability

Increasingly, product specifiers, procurement specialists and consumers are demanding “green” furniture products, i.e., products made with more sustainable materials, or products that have been produced using methods and processes that have reduced environmental impact. Furniture that has been evaluated for environmental sustainability can contribute qualifying points under a number of green building certification initiatives, including the LEED Rating System. Further, evidence of environmental sustainability can address the interests of consumers and help manufacturers distinguish their furniture products in a competitive marketplace.





Other Assessment Considerations for Furniture Manufacturers

Apart from testing mandated by regulatory or procurement requirements, furniture manufacturers often engage in additional assessments and evaluations consistent with achieving targeted levels of product quality. At a minimum, furniture manufacturers can integrate physical inspections and checks all along the production process, such as top of production (TOP) inspections, in-process quality checks, final random inspections and loading inspections.

A further step in quality assurance is the development and implementation of a formal quality management system consistent with the requirements of an internationally accepted standard, such as ISO 9001 – quality management systems – requirements. A quality system certified to ISO 9001 can codify a manufacturer’s quality requirements and provide an increased level of oversight and accountability.

Manufacturers with global supply chains may also choose to assess supply chain partners for compliance with corporate quality requirements as well as broader social values. At its simplest level, this approach can include random, unannounced visits, or mandating compliance with quality management requirements. However, compliance can also require an integrated management systems approach that includes energy

and environmental management, and mandatory labor practices to promote fair and ethical hiring and employment practices and safe working conditions.

Recommendations for Furniture Manufacturers

Given the broad range of furniture products and the complex and sometimes conflicting regulatory process, manufacturers may be understandably confused as to how to negotiate the assessment process for furniture products. Here are some recommended practices that may help:

- **Understand regulatory requirements and market demands** – Furniture and furniture products are subject to varying regulatory requirements that differ from jurisdiction to jurisdiction. The regulatory landscape is further complicated by the various types of furniture products and how individual products are categorized under the applicable requirements. To successfully navigate this complex landscape, furniture manufacturers should develop a thorough understanding of the regulatory requirements applicable to their specific products in any targeted jurisdictions, and continuously monitor regulatory developments to avoid surprises.
- **Identify required and recommended testing early in the product development**

phase – As illustrated in this white paper, there are a number of required and recommended tests and assessments covering virtually every aspect of a given furniture product, from mechanical and electrical safety testing to assessments that evaluate a product’s environmental performance. Identifying applicable tests and assessments at the earliest possible stages of the product development process can result in product design and materials selections that contribute to better test outcomes and reduce the likelihood of unexpected setbacks that require product redesign.

- **Seek testing efficiencies based on testing requirements** – A thorough understanding of applicable regulatory requirements and the early identification of required and recommended product testing will enable a manufacturer to develop a comprehensive testing and regulatory approval plan that minimizes duplicate testing, reduces testing costs and results in faster time to market.

Finally, furniture manufacturers should consider the potential value of partnering with an independent third-party with in-depth expertise in the furniture industry and broad experience in required and recommended testing and assessment of furniture products.



Summary and Conclusions

The anticipated future growth of the global furniture industry represents a significant opportunity for manufacturers. However, depending on the specific type of product, furniture products are subject to a diverse range of tests and assessments to determine their safety and environmental performance. Furniture manufacturers seeking access to the global furniture marketplace can improve their chances of success by developing an in-depth understanding of applicable regulations, integrating those requirements at the earliest possible stages of product development, and creating a testing plan to maximize testing efficiencies and reduce costs.

UL is a global independent safety science company offering a comprehensive suite of testing and certification services for manufacturers of commercial and residential furniture products. UL experts are knowledgeable about every aspect of furniture safety and performance, including mechanical safety, electrical safety, chemical emissions issues, fire safety and environmental considerations. This broad capability makes UL a single source for all furniture testing and certification needs, and a trusted resource for furniture manufacturers around the world.

For additional information about UL's furniture testing and certification services, visit www.ul.com/furniture.

Cover photo courtesy of Advanced Furniture Testing, www.furnituretest.com

¹ "Global Furniture Industry Overview 2013," BusinessVibes, May 17, 2013. Web. 26 September 2013. <http://www.businessvibes.com/blog/global-furniture-industry-overview-2013>.

² "World Furniture Outlook 2013," Press release for the 12th edition of the Seminar organized by the Centre for Industrial Studies, 2013. Web. 7 October 2013. <http://www.worldfurnitureonline.com/PDF/events/Furniture-Outlook-2013/Outlook-Press-Release-2013.pdf>.

³ "Furniture and Related Product Manufacturing," U.S. Department of Labor, Bureau of Labor Statistics, Updated 8 November 2013. Web. 9 November 2013. <http://www.bls.gov/iag/tgs/iag337.htm>.

⁴ "Furniture and Home Furnishings Stores," U.S. Department of Labor, Bureau of Labor Statistics, Updated 8 November 2013. Web. 9 November 2013. <http://www.bls.gov/iag/tgs/iag442.htm#workforce>.