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# Furniture Testing 101

*The Definitive Guide to North American Furniture Testing*



**Intertek**

4700 Broadmoor SE - Suite 200  
Kentwood, MI 49512  
1-800-WORLDFAB

<http://www.intertek.com/furniture>

[icenter@intertek.com](mailto:icenter@intertek.com)



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## Introduction

In the dynamic, North American furniture industry, a variety of testing standards apply which require a manufacturer's understanding and compliance in order to sell into the market. Specifically, a familiarity with current and upcoming standards relative to the performance, safety, flammability, and environmental status of the broad range of furniture items for commercial and residential use will enable manufacturers to ensure that they're referencing, applying, and testing to the correct standard and subsequently maximizing their likelihood of success and end user satisfaction in this competitive arena. Without these assurances, manufacturers risk impairing their speed to market, spending excessive amounts of time and money to achieve compliance, and potentially losing opportunities to bid on lucrative projects which incorporate specific targets or sustainability goals. Manufacturers also risk damaging their brand by bringing a product to market that does not meet their quality standards or the minimum industry standard.

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To aid furniture manufacturers, architects, importers, and other interested parties in understanding and complying with current and impending test standards, the following white paper will share key trends in the evolving furniture industry, highlight the major testing standards and protocols associated with the performance, electrical safety, flammability, and environmental status of the broad range of furniture items for commercial and residential use, and offer insights into the benefits of partnering with an accredited third-party testing organization to assist in the all-important testing, submission, and compliance process.

## Definitions & Trends

Comprised of thousands of manufacturers, the over \$50 billion North American market for furniture encompasses the broad range of residential pieces for all rooms/applications within a home, a wide variety of book cases, cabinets, chairs, desks, filing cabinets, and other types of office furniture, and inner spring, box spring, and non-inner spring mattresses and bases sold to retailers, wholesalers, hospitals, hotels, and the export market.

According to 2013 IBISWorld reports, the residential furniture market suffered in the previous five years as a result of the U.S. recession and subsequent slowdown in housing construction, but experienced a resurgence beginning in 2013 based on a revival in disposable income and housing starts; the growing presence of low-cost imports, however, will continue to threaten North

American manufacturers and profits in the near term. In the office furniture market, the recession, aggressive price competition from offshore importers, and rising material costs (such as that for steel) hampered industry profits in the past five years, causing a consolidation among some companies and an industry exit by others; however, a rise in corporate profits and reinvestment in business beginning in 2013 is expected to trigger a return to growth in this market. Finally, the mattress industry experienced similar declines in the past five years as the nation's recession negatively impacted consumer confidence and spending; however, growing consumer demand for mattresses that provide more personalized support to aid in better sleep as well as a forecasted growth in consumer travel (requiring ongoing investments in new mattresses by the hospitality industry) are expected to drive overall growth in the mattress market in the coming five years.

Other trends in motion in the North American furniture industry include a growing demand for furniture which incorporates more environmentally-friendly materials and/or meets heightened sustainability goals such as LEED (Leadership in Energy & Environmental Design), furniture materials, design, and construction which is better able to support overweight occupants, the increasing incorporation of electrical systems such as lighting into furniture design, heightened safety standards, and a growing movement towards the use of traditional furniture in healthcare and other crossover settings.

## Furniture Testing Explained

The following are brief descriptions of the standards and how they are designed to provide manufacturers and users with a common basis with regards to the specific type furniture testing. Requirements for furniture testing have many drivers from consumers such as (GSA) General Services Administration, designers, fire marshals, and electrical inspectors to name a few. The below summary will provide a high level overview of the different types of testing and the standards involved.

### *Performance Testing*

Performance testing is used to evaluate safety, durability, and the structural integrity of furniture. The acceptance levels and test parameters given in a standard are based on the actual field use and test experience of BIFMA International members and are intended to assess the performance of new products only, not products that have been in use. The combination of cycle and static tests used in performance testing simulate stresses that would be placed on furniture in a normal-use environment.

### *Safety Testing*

Safety testing is used to evaluate the product's electrical, mechanical, and design safety in a normal-use environment. Safety standards are designed to evaluate products based on electrical safety, mechanical design/performance, intent of the product, the conditions of use and more. The two primary safety standards writing bodies in North America are Underwriter Laboratories (UL) and CSA International.

### *Flammability Testing*

Flammability testing is used to evaluate the safety of a product to ensure that it does not ignite and pose risk to lives or property in its normal-use environment. Flammability testing has become a contentious issue as the concerns of flame retardant (FR) chemicals in products continue to rise. The requirements for flammability testing can range from the materials that make up the product, such as the foam, textiles, and laminate to the finished product. The flammability requirements can be influenced by the intended market in which the product will be sold.

### *Environmental Testing*

Environmental testing is used to evaluate the environmental, health, and sustainable attributes of a product and its manufacturers claims. The demand for chemical VOC (Volatile Organic Compounds) emission testing is increasing as product manufacturers, architects, designers, and end users are requesting chemical transparency. Voluntary and non-voluntary standards (LEEDv4, C2C, Living Future, Prop 65, and more) are requiring chemical disclosure to promote environmental and human occupant health. Product sustainability can ensure longer product life, lower greenhouse gas emissions, lower global warming potential, and decrease energy consumption and landfill waste. Demonstrating environmental, health, and sustainable attributes can increase product value while publicizing the triple bottom line: people, profit and planet.

## **Understanding the Role of Third Party Testing**

In the North American furniture industry, the ability for a manufacturer, retailer, wholesaler, importer, or architect to certify that the subject furniture products intended for commercial and residential use meet all relevant performance, safety, flammability, and environmental standards helps meet sales targets, assures end users that those products are qualified for specific end-use applications, and delivers manufacturers other marketing and sales advantages as well. Because specific standards and submission procedures can be very tedious and precise to administer but are highly critical to a company's growth and sales objectives, manufacturers may choose to avail themselves of a skilled third party testing organization with expertise in the standards-setting, testing, and compliance processes to ensure maximum success.

Accredited third-party external safety and performance testing organizations, like Intertek, can help take the guess-work out of the all-important process of testing and the pursuit and successful achievement of compliance. Their possession of and investment in the highest-tech and most precise and capital-intensive testing equipment ensures consistent testing procedures and accurate results, while their demonstrated expertise in the unique details and current requirements of all industry certification programs and initiatives assures manufacturers of the utmost in quality coverage and representation. Along with the relationships they've established with all of the industry's key certifying organizations over the years, a third-party testing lab's exceptional understanding of and experience with the broad range of products and testing procedures in the dynamic furniture industry can proactively support a manufacturer's compliance while delivering security and peace of mind to both manufacturers and customers alike.

## About Intertek

Intertek is the leading quality solutions provider to industries worldwide. From auditing and inspection, to testing, training, advisory, quality assurance and certification, Intertek adds value to customers' products, processes and assets. With a network of more than 1,000 laboratories and offices and over 36,000 people in more than 100 countries, Intertek supports companies' success in a global marketplace. Intertek helps its customers to meet end users' expectations for safety, sustainability, performance, integrity and desirability in virtually any market worldwide. Visit [www.intertek.com/furniture](http://www.intertek.com/furniture).

## Contact Us

If you would like to connect with an expert to answer your technical questions or obtain a quote for a new testing project, contact Intertek at 1-800-WORLDFAB or [icenter@intertek.com](mailto:icenter@intertek.com).

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# Appendix

## Appendix A – Performance Testing

**Standards-Setting Organization** – The Business and Institutional Furniture Manufacturers Association (BIFMA) develops and publishes standards for commercial-grade office furniture products; residential furniture manufacturers are encouraged to review these standards with an accredited testing organization to determine how to best apply these standards to their product. The standards are developed in accordance with American National Standards Institute (ANSI) procedures.

**Purpose of Testing** – Standards are designed to provide manufacturers and users with a common basis for evaluating safety, durability, and the structural integrity of furniture. The acceptance levels and test parameters given in this standard are based on the actual field use and test experience of BIFMA International members and are intended to assess the performance of new products only, not products that have been in use. The combination of cycle and static tests used in performance testing simulate stresses that would be placed on furniture in a normal-use environment.

### Key Testing Standards

#### **ANSI BIFMA x5.1 General Purpose Office Chairs** (Issued: 2011)

This standard is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of general-purpose office chairs, which are normally used in an office environment and may include, but are not limited to, those seating styles typically referred to as ‘executive/management,’ ‘task/secretarial,’ ‘side/guest chairs,’ ‘stacking chairs,’ ‘tablet arm chairs’ and ‘stools.’

The standard defines specific tests, the laboratory equipment that may be used, the conditions of tests, and the minimum acceptance levels to be used in evaluating general-purpose office chairs. Where appropriate, the CAESAR anthropometric database (2002 report), which indicates that the 95th percentile male weighs 253 pounds, was used in the development of the tests. The tests were developed with an estimated product life of ten years based on single-shift usage. Product life will be affected by user size/weight, product use, care and maintenance, environment, and other factors, and, as such, product compliance to this standard does not necessarily guarantee a ten-year product life.

ANSI BIFMA x5.1 General Purpose Office Chairs			
Section	Test Description	Section	Test Description
5	Backrest Strength Test – Static – Type I	15	Backrest Durability Test – Cyclic – Type I
6	Backrest Strength Test – Static – Type II & III	16	Backrest Durability Test – Cyclic – Type II & III
7	Base Test - Static	17	Caster / Chair Base – Durability Test - Cyclic
8	Drop Test - Dynamic	18	Leg Strength – Front & Side Application
9	Swivel Test - Cyclic	19	Footrest Static Load Test - Vertical
10	Tilt Mechanism Test - Cyclic	20	Footrest Durability Test – Vertical - Cyclic
11	Seating Durability Test - Cyclic	21	Arm Durability Test - Cyclic
12	Stability Test	22	Out Stop For Chairs w/ Manually Adjustable Seat Depth
13	Arm Strength –Vertical - Static	23	Tablet Arm Static Load
14	Arm Strength – Horizontal - Static	24	Tablet Arm Load Ease Test - Cyclic



**ANSI BIFMA X5.3 Vertical Files** (Issued: 2007)

This standard is intended to provide a common basis for evaluating the safety, durability, and structural performance of vertical files. The standard defines tests used to determine the acceptability of the product and specifies the acceptance levels of performance.

ANSI BIFMA X5.3 Vertical Files			
Section	Test Description	Section	Test Description
4	Stability Test	11	Out Stop Test
5	Unit Strength Test (Includes Proof and Functional Loads)	12	Lock Tests
6	Racking Resistance Test	12.1	Force Test for Locks
7	Drop Test	12.2	Locking Mechanism Cycling Test
8	Extendible Element Cycle Test	13	Latch Test (Static)
9	Interlock Test	14	Compressor Test
10	Rebound Test	15	Pull Force Test

**ANSI BIFMA X5.4 Lounge and Public Seating** (Issued: 2012)

This standard is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of business and institutional lounge and public seating, which is normally used in indoor public spaces such as waiting, reception, or gathering areas and includes products with single seat units, units with multiple seating positions within one unit, or ganged seating units. Lounge and public seating may be restrained from moving by attaching to the building structure or freestanding and are generally not adjustable for personal use. This standard does not address general-purpose or task-oriented office chairs, or seating used for stadiums, auditoriums, lecture rooms, airports/train stations, and similar high-use public seating areas. Where a product may be covered by more than one ANSI/BIFMA standard, the manufacturer shall determine which standard provides most appropriate test conditions. Where a product is intended for use outside of the commercial office and related institutional environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations.

Where appropriate, the CAESAR anthropometric database (2002report), which indicates that the 95th percentile male weighs 253 pounds, was used in the development of the tests. The tests were developed with an estimated product life of ten years based on continuous single-shift usage. Product life will be affected by user size/weight, product use, care and maintenance, environment, and other factors, and, as such, product compliance to this standard does not necessarily guarantee a ten-year product life. Products may perform longer than 10 years with appropriate use and care. This standard may not apply to seating for persons in medically compromised conditions that are often found in certain healthcare environments, such as physical therapy and weight loss clinics. These environments may require specific product designs that may not be adequately covered by the requirements of this standard.

ANSI BIFMA X5.4 Lounge and Public Seating			
Section	Test Description	Section	Test Description
5	Backrest Strength Test - Horizontal - Static	15	Drop Test - Dynamic
6	Backrest Strength Test - Vertical - Static	16	Leg Strength Test - Front and Side Application
7	Backrest Durability Test - Horizontal - Cyclic	17	Unit Drop Test - Dynamic
8	Backrest Durability Test - Vertical - Cyclic	18	Caster/Unit Base Durability Test - Cyclic
9	Arm Strength Test - Horizontal - Static	19	Swivel Test - Cyclic
10	Arm Strength Test - Vertical - Static	20	Tilt Mechanism Test - Cyclic
11	Arm Durability Test - Horizontal - Cyclic	21	Stability Tests
12	Arm Durability Test – Vertical - Cyclic	22	Tablet Arm Load Ease Test - Cyclic
13	Arm Durability Test - Angular - Cyclic	23	Tablet Arm Load Test - Static
14	Seating Durability Test - Cyclic		

**ANSI BIFMA X5.5 Desk/Table Products** (Issued: 2014)

This standard provides a common basis for evaluating the safety, durability, and structural performance of desk/table products intended for use in commercial office and related institutional environments such as educational environments and provides test methods and performance requirements for desk/table products. Where a product may be covered by more than one ANSI/BIFMA standard, the manufacturer shall determine which standard provides the most appropriate test conditions. Where a product is intended for use outside of the commercial office and related institutional environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations.

*NOTE: Commercial product naming conventions may cause confusion regarding the applicability of this and other BIFMA standards. For example, a “credenza” is typically defined and tested in the BIFMA X5.5 Desk standard; however, some configurations of “credenzas” will appear to be storage products within the definition of this standard and may be appropriately tested by X5.9 Storage Units - Tests standard. The manufacturer shall determine which standard provides the most appropriate test conditions.*

The tests were developed with an estimated product life of ten years based on a single-shift usage. Product life will be affected by product use, care and maintenance, environment, and other factors. Product compliance to this standard does not necessarily guarantee a ten-year product life. Products may perform longer than ten years with appropriate use and care.

ANSI BIFMA X5.5 Desk/Table Products			
Section	Test Description	Section	Test Description
4	Stability Tests	14.2	Force Test for Extendible Element Locks
4.2	Stability with Extendible Elements Open Test	14.3	Force Test for Door Locks
4.3	Stability Under Vertical Load Test	14.4	Locking Mechanism Cycle Test
4.4	Horizontal Stability Test for Desks/Tables with Casters	15	Work Surface Vertical Adjustment Test
4.5	Stability Test for Keyboard/Laptop Tables (with and without casters)	16	Keyboard Support and Input Device Support Adjustment Tests
4.6	Force Stability Test for Tall Desk/Table Products	17	Door Tests
5	Unit Strength Test	17.2	Strength Test for Vertically-Hinged Doors, Bi-fold Doors, and Vertically Receding Doors
5.2	Concentrated Functional Load Test	17.3	Hinge Override Test for Vertically-Hinged Doors
5.3	Distributed Functional Load Test	17.4	Vertically Receding Doors Strength Test
5.4	Concentrated Proof Load Test	17.5	Horizontal Receding Doors Strength Test
5.5	Distributed Proof Load Test	17.6	Wear and Fatigue Test for Hinged, Horizontal Sliding, and Tambour Doors
5.6	Transaction Surface Torsion Load Test	17.7	Wear and Fatigue Test for Vertical Receding Doors
5.7	Extendible Element Static Load Test	17.8	Wear and Fatigue Test for Horizontal Receding Doors
5.8	Benching Systems – Distributed Functional Load and Stability Test	17.9	Vertical and Horizontal Receding Door Out Stop Test – Cyclic Impact and Durability
5.9	Benching Systems – Distributed Proof Load Test	17.10	Slam Closed Test for Vertically Hinged and Vertically Receding Doors
6	Top Load Ease Cycle Test	17.11	Drop Cycle Test for Horizontally Hinged and Horizontally Receding Doors
7	Desk/Table Unit Drop Test	17.12	Slam Test for Doors that Free Fall Open or Closed
8	Leg Strength Test	17.13	Slam Open and Closed Test for Doors That Do Not Free Fall
9	Separation Tests for Tall Desk/Table Products	17.14	Door Latch Test
10	Extendible Element Cycle Test	18	Durability Test for Desks and Tables with Casters
10.2	Cycle Test for Extendible Elements Deeper than Wide	19	Pull Force Test
10.3	Cycle Test for Extendible Elements Wider than Deep	20	Tilting Top Table – Cycle Test
10.4	Cycle Test for Low Height Drawers	21	Tilting Top Table – Latch Strength Test
11	Extendible Element Retention Impact and Durability (Out Stop) Tests	22	Monitor Arm Strength Test
12	Extendible Element Rebound Test	23	Monitor Arm Cyclic Test
13	Interlock Strength Test	24	Monitor Arm Dislodgement Test
14	Lock Tests		

**ANSI BIFMA X5.6 Panel Systems (Issued: 2010)**

This standard is intended to provide a common basis for evaluating the safety, durability, and structural performance of panel systems products, such as panels, screens, panel-supported systems, and various hang-on components used in conjunction with panel systems products. Building wall-mounted components are not covered by this standard; they are covered by ANSI/BIFMA X5.9 Standard for Office Furniture Storage Units – Tests. Where a product may be covered by more than one ANSI/BIFMA standard, the manufacturer shall determine which standard provides most appropriate test conditions. Where a product is intended for use outside of the commercial office and related institutional environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations. This standard specifies acceptance levels to help ensure reasonable safety and performance independent of construction materials, manufacturing processes, mechanical designs, or aesthetic designs. The acceptance levels herein are based on the actual field and test experience of BIFMA International members. This standard also provides recommendations for acoustical performance of panel systems products. The standard defines tests used to determine the acceptability of the product and specifies the acceptance levels of performance. These tests are not intended to assess a product that has been in use.

*NOTE: The scope of this standard includes panel system products and related components only. Requirements for freestanding and mobile furniture products are included in other BIFMA standards.*

ANSI BIFMA X5.6 Panel Systems			
Section	Test Description	Section	Test Description
4	Panel Flammability Quoted Upon Request	9	Lock Tests – Static
5	Stability Tests for Panel Systems Products	9.1	Test for Extendible Element Locks
5.1	Force Stability Test	9.2	Force Test for Door Locks
5.2	Impact Stability Test	10	Panel Mounted Component Cyclic Durability Tests
5.3	Force Stability Test for Screens	10.1	Work Surface Durability (Top Load Ease) Test
6	Mechanical Strength Tests for Panel Systems Products	10.2	Cycle Test for Extendible Elements Deeper Than Wide
6.2	Panel System Strength Test – Static Functional Load	10.3	Cycle Test for Extendible Elements Wider Than Deep
6.3	Panel System Strength Test – Static Proof Load Results Reported with Section 6.2	10.4	Cycle Test for Center/Pencil Drawers
7	Panel Glide Assembly Strength Test	10.5	Extendible Element Retention Impact and Durability Tests
8	Panel Component Static Load Tests	10.6	Rebound Test
8.1	Primary Surface Concentrated Functional Load Test	10.7	Locking Mechanism Cycle Test
8.2	Horizontal Surface Distributed Functional Load Tests	10.8	Keyboard Support and Input Device Support Adjustment Tests
8.3	Primary Surface Concentrated Proof Load Tests Reported with Section 8.2	10.9	Work Surface Vertical Adjustment Test
8.4	Horizontal Surface Distributed Proof Load Tests	11	Door Tests
8.5	Transaction Surfaces Torsional Load Test	11.2	Strength Test for Vertically Hinged Doors, Bi-fold Doors, and Vert. Receding
8.6	Functional Load Test for Panel Mounted Storage Units – Static	11.3	Hinge Override Test for Vertically Hinged Doors

ANSI BIFMA X5.6 Panel Systems (continued)			
11.4	Vertical Receding Doors Strength Test	11.12	Slam Test for Doors which Free-Fall Open or Closed
11.5	Horizontal Receding Doors Strength Test	11.13	Slam Open/Closed Test for Doors that Do Not Free-Fall
11.6	Wear and Fatigue Tests for Hinged, Horizontally Sliding, and Tambour Doors	11.14	Door Latch Test
11.7	Wear and Fatigue Test for Vertical Receding Door	12	Disengagement Tests for Panel Mounted Components
11.8	Wear and Fatigue Test for Horizontal Receding Door	12.1	Upward Force Static Disengagement Test
11.9	Vertical or Horizontal Receding Door Out Stop Test, Cyclic Impact & Durability	12.2	Upward Force Impact Disengagement Test
11.10	Slam Closed Test for Vertically Hinged Doors	13	Pull Force Test Results Reported with Above Test Data
11.11	Drop Test for Horizontally Hinged Doors – Cyclic		

**ANSI BIFMA X5.9 Storage Units (Issued: 2012)**

This standard is intended to provide a common basis for evaluating the safety, durability, and structural performance of storage units, which include freestanding, mobile, and wall-mounted storage units. Where a product may be covered by more than one ANSI/BIFMA standard, the manufacturer shall determine which standard provides most appropriate test conditions. Vertical files shall only be tested under X5.3 Vertical Files - Tests. Where a product is intended for use outside of the commercial office and related institutional environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations.

*Note: Commercial product naming conventions may cause confusion regarding the applicability of this and other BIFMA standards. For example, a “credenza” is typically defined and tested in the BIFMA X5.5 Desk standard; however, some configurations of “credenzas” will appear to be storage products within the definition of this standard and may be appropriately tested by this standard. The manufacturer shall determine which standard provides most appropriate test conditions.*

The tests were developed with an estimated product life of ten years based on a single-shift usage. Product life will be affected by product use, care and maintenance, environment, and other factors: product compliance to this standard does not necessarily guarantee a ten-year product life. Products may perform longer than ten years with appropriate use and care.

ANSI BIFMA X5.9 Storage Units			
Section	Test Description	Section	Test Description
4	Unit Strength Test	7.3	Durability Test for Units with Seating Surfaces – Cyclic Impact
5	Leg/Glide Assembly Strength Test	8	Separation and Disengagement Tests
6	Racking Resistance Test	8.1	Separation Test for Tall Storage Units with Vertically Attached or Stackable Components
7	Vertical Load Durability Tests	8.2	Upward Impact Force Disengagement Test for Storage Units
7.1	Top Load Ease Cycle Test	8.3	Upward Force Static Disengagement Test for Storage Units
7.2	Drop Test – Dynamic – for Units with Seat Surfaces	9	Stability Tests

ANSI BIFMA X5.9 Storage Units (continued)			
9.2	Horizontal Force Stability Test for Tall Storage Units	13	Extendible Element Retention Impact and Durability (Out Stop) Tests
9.3	Stability Test for Type I Units with at least one Extendible Element	14	Lock Tests
9.4	Stability Test for Type I Storage Units with Multiple Extendible Elements	14.2	Force Test for Extendible Element Locks
9.5	Stability Test for Type II Storage Units having Extendible Elements	14.3	Force Test for Door Locks
9.6	Vertical Force Stability Test for Storage Units	14.4	Locking Mechanism Cycle Test
9.7	Stability Test for Pedestals/Storage Units with Seat Surfaces	15	Extendible Element Cycle Tests
10	Storage Unit Drop Test	15.2	Cycle Tests for Extendible Elements Deeper than Wide that Do Not Swivel
11	Movement Durability Test for Mobile Storage Units	15.3	Cycle Tests for Extendible Elements Wider than Deep that Do Not Swivel
12	Rebound Test	15.4	Horizontal Cycle Test for Television/Video Display Terminal Extendible Elements

**ANSI BIFMA X6.1 Educational Seating** (*Issued: 2012*)

This standard is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of Educational Seating, including units with integrated desk or table surfaces. The tests in this standard are intended to evaluate seating for students in pre-school, elementary, middle school, high school, adult education, trade school, and college, for learning and common space environments. These tests are not intended to evaluate products used in living/dorm environments. The educational seating products covered by this standard are normally used in schools and colleges and include those typically referred to as chairs, stacking chairs, tablet-arm chairs, chair/desks, stools, and convertible bench/tables. Neither folding chairs nor seating products that are anchored to the building floor or structure are covered by this standard. Chairs with tilting seats and/or backs such as executive/management chairs, task/secretarial/teacher chairs, and side/guest chairs may be used in educational environments, but these products are covered by ANSI/BIFMA X5.1 General-Purpose Office Chairs - Tests (designated within that standard as Type I and II). Similarly, items such as lounge seating may also be used in the educational environment; however, these are covered by ANSI/BIFMA X5.4 Lounge Seating - Tests. Mobile cafeteria tables with attached seating are covered by UL 2040 "Folding Rollaway Tables."

Where a product may be covered by more than one ANSI/BIFMA standard, the manufacturer shall determine which standard provides most appropriate test conditions. Where a product is intended for use outside of the educational and related institutional environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations.

Tests in this standard were developed considering the weight ranges based on age (not grade level) for the size categories – see Table 2. These weights were taken from CAESAR and/or NHANES as appropriate. Chair size (categories) was based on size/weight information from NHANES combined data set years 2005-2008. Where appropriate, the CAESAR anthropometric database (2002 report), which indicates the 95th percentile male weighs 253 pounds, was used in the development of the tests for size C. This standard also considered the occasional use of the smaller (Category A and B) products by adults. The tests were developed with an estimated product life of ten years based on estimates for usage as determined by the manufacturer’s experience and research.

In general, seating was estimated to be used 6.5 to 8 hours/day and 170-180 days per year for learning environments and other common space environments and 2 to 4 hours/day for convertible bench tables. Product life will be affected by user size/weight, daily hours of use, product use, care and maintenance,

environment, and other factors, and, as such, product compliance to this standard does not necessarily guarantee a ten-year product life. Actual life of the product may be more or less than ten years depending on the aforementioned factors.

ANSI BIFMA X6.1 Educational Seating			
Section	Test Description	Section	Test Description
5	Stability Tests	15	Durability Test for Convertible Bench Tables with Casters
6	Backrest Strength Test - Static	16	Leg Strength Tests
7	Backrest Durability Test - Cyclic	17	Structural Member Strength Test
8	Drop Test - Dynamic	18	Swivel Test - Cyclic
9	Seat Static Load Test for Chair Desks and Fixed-Tablet Arm Chairs	19	Tablet Arm Test - Front Stability
10	Seating Durability Tests - Cyclic	20	Tablet Arm Static Load Test
11	Arm Strength Test - Vertical - Static	21	Tablet Arm Load Ease Test - Cyclic
12	Arm Strength Test - Horizontal - Static	22	Chair Desk and Table Top Horizontal Surface Vertical Load Tests
13	Arm Durability Test - Angular - Cyclic	23	Chair Desk and Convertible Bench Table Top Load Ease Test - Cyclic
14	Caster/Chair Base Durability Test - Cyclic	24	Static Loading of Storage (Backpack) Hooks & Unit Stability

**ANSI/BIFMA S6.5 Small Office/Home Office Furniture (Issued: 2008 (R2013))**

This standard is intended to provide a common basis of mechanical tests for evaluating the safety, durability, and structural adequacy of storage and desk-type furniture intended for use in the small office and/or home office. The styling, marketing, and chain of distribution for these products are intended to address usage in a residential, home office, or small office environment. These products may be completely assembled, partly assembled, or totally unassembled (often known as RTA or “ready to assemble”), when they leave the control of the manufacturer; partly assembled and RTA products are designed to be assembled by the end user. Where a product is intended for use outside of the small office and home office environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations.

This standard defines tests used to determine acceptability of the product for the intended and reasonably foreseeable uses of the product. Reasonable safety of the product shall be considered the manufacturer's responsibility only to the extent that the product is assembled and used in accordance with the original manufacturer's instructions. The assembler must follow the manufacturer's instructions to ensure the product performs as designed.

ANSI/BIFMA S6.5 Small Office/Home Office Furniture			
Section	Test Description	Section	Test Description
4	Stability Tests	11.3	Force Test for Door Locks
4.2	Stability Under Vertical Load Test	12	Extendible Element/Equipment Surface Test - Cyclic
4.3	Stability Test for Units with Extendible Load-Bearing Elements	12.2	Cycle Test for Extendible Elements/Equipment Surfaces Deeper Than Wide
4.4	Stability Test for Freestanding Pedestals	12.3	Cycle Test for Extendible Elements/Equipment Surfaces Wider Than Deep
4.5	Horizontal Stability Test for Desk/Tables with Casters	12.4	Cycle Test for Center/Pencil Drawers
4.6	Horizontal Force Stability/Disengagement Test for Tall Units	13	Extendible Element/Equipment Surface Retention Tests
4.7	Vertical Force Stability For Bookcases and Other Units Without Extendible Elements	14	Rebound Test
4.8	Horizontal Force Stability for Bookcases and Other Units Without Extendible Elements	15	Keyboard Support and Input Device Support Adjustment Tests
5	Static Load Tests	16	Hinged Door Tests
5.2	Distributed Functional Load Test for Individual Surfaces	16.1	Strength Test for Vertically Hinged Doors
5.3	Concentrated Functional Load Test For Primary Surfaces	16.2	Wear and Fatigue Tests for All Hinged Doors
5.4	Distributed Proof Load Test for Individual Surfaces	16.3	Slam Open/Closed Test for Vertically Hinged Doors
5.5	Concentrated Proof Load Test for Individual Surfaces	16.4	Drop Cycle Test for Horizontally Hinged and Horizontally Receding Doors
5.6	Unit Strength Test - Static Load	17	Receding Door Tests - Cyclic
5.7	Extendible Element Proof Load Test	17.2	Test for Horizontal Receding Doors
6	Top Load Ease Test - Cyclic	17.3	Test for Vertical Receding Doors
7	Leg Strength Test - Static	18	Sliding and Tambour Door Tests - Cyclic
8	Horizontal Racking Resistance Test	18.2	Wear and Fatigue Test
9	Interlock Test - Static	18.3	Slam Open and Closed Test for Doors Which Do Not Free Fall
10	Drop Test	19	Durability Test for Products with Casters - Cyclic
11	Lock Tests	20	Pull Force Test
11.2	Force Test for Extendible Element Locks		



*Upcoming Changes or New Standards*

**BIFMA X5.11 – General Purpose Large Occupant Office Chairs**

*Projected Release: End of 2014*

Standard was approved on January 5, 2015

This standard is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of office chairs for large occupants (often referred to as “users” throughout this standard).

Large occupant office chairs are normally used in an office environment and may include, but are not limited to those seating styles typically referred to as: executive/management, task/secretarial, side/guest chairs, and stacking chairs. This standard describes the means of evaluating large occupant office chairs, independent of construction materials, manufacturing processes, mechanical designs or aesthetic designs. This standard does not address lounge seating, stools, flammability, surface material durability, cushioning materials, or product emissions.

The standard defines specific tests, laboratory equipment that may be used, conditions of tests, and the minimum acceptance levels to be used in evaluating large occupant office chairs. The acceptance levels and test parameters given in this standard are based on the actual field use and test experience of BIFMA members. Where appropriate, the National Health and Nutrition Examination Survey (NHANES) 05-08, which indicates the 99.5th percentile male weight approaches 400 pounds, was used in the development of the tests. Chairs that are designed to this standard must have seat widths of 560 mm (22 in.) or greater (See Section 5). *Chairs with seat widths at or wider than this may be used by smaller individuals, but may not be ergonomically correct or comfortable for smaller users. Users of this standard are discouraged from applying this standard to general office chairs, which are covered by the X5.1 standard.*

The tests were developed with an estimated product life of ten years based on single-shift usage. Product life will be affected by user size/weight, product use, care and maintenance, environment, and other factors, and, as such, product compliance to this standard does not necessarily guarantee a ten-year product life.

BIFMA X5.11 – General Purpose Large Occupant Office Chairs			
Section	Test Description	Section	Test Description
5	Seat Width Measurement	15	Backrest Durability Test – Cyclic – Type I
6	Backrest Strength Test - Static - Type I	16	Backrest Durability Test – Cyclic – Type II & III
7	Backrest Strength Test - Static - Type II and III	17	Caster/Chair Base Durability Test - Cyclic
8	Drop Test – Dynamic	18	Leg Strength Test - Front and Side Application
9	Swivel Test – Cyclic	19	Arm Durability Test - Cyclic
10	Tilt Mechanism Test - Cyclic	20	Out Stop Tests for Chairs with Manually Adjustable Seat Depth
11	Seating Durability Test - Cyclic	21	Tablet Arm Static Load Test
12	Stability Tests	22	Tablet Arm Load Ease Test - Cyclic
13	Arm Strength Test - Vertical – Static	23	Structural Durability Test
14	Arm Strength Test - Horizontal – Static		

**BIFMA Healthcare Patient Seating**

*Projected Release: No projected release date*

This standard is intended to provide manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, and structural adequacy of healthcare patient seating, which is normally used in indoor public spaces such as waiting, reception, or patient room areas. Healthcare patient seating includes products with single seat units, units with multiple seating positions within one unit, or ganged seating units. Healthcare patient seating may be restrained from moving by attaching to the building structure or freestanding. This standard covers stools, sofa beds, recliners, exam chairs, lounge seating, and heavy occupant seating. This standard does not address general-purpose or task-oriented chairs (healthcare staff). Products designed to meet this standard should also be appropriate to use in nursing homes, assisted living facilities, and for home healthcare use. Products designed to the requirements in this standard may not be appropriate for use in psychiatric facilities; products for use in those environments typically have additional design requirements/considerations that are not addressed in this standard. This standard does not address Class II medical devices as defined by the FDA (CFR 820).

Where a product may be covered by more than one ANSI/BIFMA standard, the manufacturer shall determine which standard provides most appropriate test conditions. Where a product is intended for use outside of the healthcare and related institutional environments, it is the responsibility of the user of this standard to determine if it is suitable for use in such evaluations.

## Appendix B – Safety Testing

**Standards-Setting Organization** – Underwriters Laboratories (UL) and American National Standards Institute (ANSI).

**Purpose of Testing** – Standards are designed to provide manufacturers and users with a common basis for evaluating the product's electrical, mechanical, and design safety in a normal-use environment.

### *Key Testing Standards, Protocols, & Equipment*

#### **UL 65 – Standard for Wired Cabinets (Issued: Dec 1955 / Ed: 7 Rev: 2010/26/10)**

- 1.1 These requirements cover wired cabinets (showcases) for use in other than hazardous (classified) locations in accordance with the National Electrical Code, NFPA 70.
- 1.2 These requirements cover display cases (showcases) and special-purpose cabinets containing electrical wiring, with or without illumination.
- 1.3 These requirements also cover wired cabinets and display cases (showcases) of such size that they must be sectionalized for shipping from the factory, and assembled and wired at the installation site.
- 1.4 These requirements do not cover bathroom cabinets, cabinets provided with or designed for use with refrigeration equipment, or general use cabinets or boxes intended for the enclosure of electrical equipment.

#### **UL 962 - Household and Commercial Furnishings (Issued: 2008/07/07 | Ed: 4 Rev: 2014/11/07)** **THIS FOURTH EDITION REPLACES THE THIRD EDITION. AS OF JANUARY 1, 2016, UL 962, EDITION 3 WILL BE WITHDRAWN**

- 1.1 These requirements cover:
  - a) Motor-operated furniture, such as motor-operated beds lift, chairs and blood donor chairs;
  - b) Electrified and non-electrified furniture;
  - c) Non-seasonal electrical decorations such as lava lamps and wave machines;
  - d) Home and individual office furnishings, such as study carrels, consoles and desks;
  - e) Commercial product and informational retail sale displays such as:
    - 1) Shelving units (Gondolas);
    - 2) Merchandise kiosks (such as the mini-stores in the middle of a mall);
    - 3) Cash station stands (POS – Point of Sale);
    - 4) Motorized carpet displays; and
    - 5) Product platforms
  - f) Electrified building components, such as heated and electro-chromatic windows and illuminated mirror and bathroom television cabinets;
  - g) Illuminated make-up mirrors;
  - h) Other similar miscellaneous furnishings intended for use in residential or commercial environments;
  - i) Conference room tables; and
  - j) Massage tables.
- 1.2 These requirements cover products rated 600 V ac or less.
- 1.3 A furnishing intended to support audio/video equipment shall be evaluated in accordance with one of the following:
  - a) If the audio/video support system is an entertainment center, cart, or a stand and it is intended for support or attachment of audio/video equipment, the Standard for Household, Commercial, and Institutional-Use Carts, Stands and Entertainment Centers for Use with Audio and/or Video Equipment, UL 1678 applies;
  - b) If the audio/video support system is intended to be mounted to walls, ceilings or another part of a building structure as the primary support means, the Standard for Wall- and Ceiling-Mounts and Accessories, UL 2442, applies;

- c) If a cart, stand or support surface is supplied with the audio or video equipment by the manufacturer of the audio or video equipment, the requirements contained in the Standard for Audio, Video, and Similar Electronic Apparatus-Safety Requirements, UL 60065, or the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, as applicable to the product applies;
  - d) Information Technology and Communications Equipment Cabinets, Enclosure and Rack Systems are investigated to the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 or the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1;
  - e) For retail product displays incorporating audio/video equipment to attract attention to the products for sale, UL 962 applies.
- 1.4 These requirements do not cover products intended for patient care areas. Patient care area products utilized under the supervision of a health care professional are covered by the Standard for Medical Electrical Equipment, Part 1: General Requirements for Safety, UL 60601-1.
  - 1.5 Motorized equipment used for massaging and exercising is covered under the Standard for Motor-Operated Massage and Exercise Machines, UL 1647.
  - 1.6 Office furnishings are covered by the Standard for Office Furnishings, UL 1286.
  - 1.7 Illuminated display cases, showcases and cabinets, such as jewelry display cases, used in commercial applications are covered by the Standard for Wired Cabinets, UL 65.
  - 1.8 Advertising displays may also be covered by the Standard for Electric Signs, UL 48.
  - 1.9 Self-contained, custom-built kiosks that provide information, ticket machines, electronic point-of-sale products, customer self-checkout stands, and business application products are covered by the Outline of Investigation for Custom Built Kiosks, UL 2361.
  - 1.10 These requirements do not cover portable luminaires. The Standard for Portable Electric Luminaires, UL 153 covers portable luminaires.
  - 1.11 A product that employs an electromagnetic interference filter shall also comply with the Standard for Electromagnetic Interference Filters, UL 1283. A product that employs a transient voltage surge suppressor shall also comply with the Standard for Surge Protective Devices, UL 1449. Telephone equipment and communication circuit protectors included in a furnishing shall comply with the requirements in the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, and the requirements in the Standard for Secondary Protectors for Communications Circuits, UL 497A, respectively. A furnishing that incorporates an antenna discharge unit or provides antenna connections to a television, a high-voltage video product, or antenna shall comply with the applicable requirements in the Standard for Antenna Discharge Units, UL 452, and the Standard for Audio-Video Products and Accessories, UL 1492. A product that employs ground-fault protection shall comply with the requirements in the Standard for Ground-Fault Circuit Interrupters, UL 943.
  - 1.12 Bunk bed structural requirements are covered by the Standard Consumer Safety Specification for Bunk Beds, ASTM F1427. Any electrical components of bunk beds are required to meet the applicable requirements of UL 962.
  - 1.13 Toy chest structural requirements are covered by the Standard Consumer Safety Specification for Toy Chests, ASTM F834. Any electrical components of these products are required to meet the applicable requirements of UL 962.
  - 1.14 These requirements do not cover products that are specifically intended for infants or juveniles. Cribs are covered by Federal Register 16 CFR Parts 1219, 1220, and 1500 Safety Standards for Full-Size Baby Cribs and Non-Full-Size Baby Cribs.
  - 1.15 Furnishings incorporating low pressure inflators are covered by the Standard for Motor-Operated Air Compressors, Vacuum Pumps, and Painting Equipment, UL 1450, and in addition shall comply with the applicable requirements of UL 962.
  - 1.16 These requirements do not cover seasonal (holiday products) – A product painted in colors to suggest a holiday theme such as a snow covering, a figure in a holiday costume, or any decoration associated with a holiday or particular season of the year.
  - 1.17 These requirements do not cover furnishings, equipment or appliances that are covered by requirements that are separate from this standard.

**UL 60950-1 – Information Technology Equipment** (*Second Edition, 2007*)

This standard is applicable to mains-powered or battery-powered information technology equipment, including electrical business equipment and associated equipment, with a RATED VOLTAGE not exceeding 600 V and designed to be installed in accordance with the Canadian Electrical Code, Part I, CSA C22.1-09; General Requirements – Canadian Electrical Code, Part II, CSA C22.2 No. 0-10; the National Electrical Code, NFPA 70-2008; and the National Electrical Safety Code, IEEE C2-2007.

The standard is also applicable to equipment, unless otherwise identified by a marking or instructions, designed to be installed in accordance with Article 645 of the National Electrical Code, ANSI/NFPA 70, and the Standard for the Protection of Information Technology Equipment, NFPA 75-2009.

This standard is also applicable to such information technology equipment:

- Designed for use as telecommunication terminal equipment and TELECOMMUNICATION NETWORK infrastructure equipment, regardless of the source of power;
- Designed and intended to be connected directly to, or used as infrastructure equipment in, a CABLE DISTRIBUTION SYSTEM, regardless of the source of power;
- Designed to use the AC MAINS SUPPLY as a communication transmission medium (see Clause 6, Note 4 and 7.1, Note 4).

This standard is also applicable to components and subassemblies intended for incorporation in information technology equipment. It is not expected that such components and subassemblies comply with every aspect of the standard, provided that the complete information technology equipment, incorporating such components and subassemblies, does comply.

**UL-60335-1 – Household and Similar Electrical Appliances** (*Fifth Edition, 2011*)

This International Standard deals with the safety of electrical appliances for household and similar purposes, their RATED VOLTAGE being not more than 250 V for single-phase appliances and 480 V for other appliances. Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances intended to be used by laymen in shops, in light industry and on farms, are within the scope of this standard (examples of such appliances are catering equipment, cleaning appliances for industrial and commercial use and appliances for hairdressers).

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account:

- persons (including children) whose physical, sensory or mental capabilities or lack of experience and knowledge prevents them from using the appliance safely without supervision or instruction
- children playing with the appliance

**CSA C22.2.68 - Motor-Operated Appliances (Household and Commercial)** (*Issued: 2009/09/01 Ed: 7*)

This standard applies to motor-operated appliances\* intended for use with nominal system voltages of 600 V and less, except that where appliances are driven by universal-type motors or electromagnetic mechanisms, the scope is limited to appliances rated for use on nominal system voltages of 240 V or less. This standard applies to appliances designed to be used in accordance with the Rules of the Canadian Electrical Code, Part I.

*\*For convenience, the term "appliance" or "equipment" is used in this Standard*

This standard applies to permanently connected and cord-connected appliances for household and commercial use in non-hazardous locations. (Note: The products covered by this standard include shaving and massage appliances, hair clippers, sewing machines, automotive servicing equipment, air compressors, car wash equipment, chairs, beds, exercise appliances, paint sprayers, paint rollers, parts cleaners, household trash compactors, food-waste disposers, barbecue motors, hand-held engravers, and similar equipment.

This standard applies to sprayers intended for extensive open spraying of cleaning fluids, paint, insecticides, and similar liquids having a flashpoint higher than 60 °C, but excluding electrostatic sprayers and sprayers for use in spray booths or in other areas where hazardous concentrations of flammable vapors are likely to be present.

Automotive equipment covered by this standard, such as wheel aligners, engine timing lights, and analyzers, might or might not have motors.

Requirements for cord-connected double-insulated appliances are specified in Clause 8.

This standard does not include requirements for equipment covered by a specific standard under the Canadian Electrical Code, Part II (e.g., drafting tables, pencil sharpeners).

In CSA standards, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; “may” is used to express an option or that which is permissible within the limits of the standard; and “can” is used to express possibility or capability. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

#### **UL 962A - Furniture Power Distribution Units** *(Issued: 2008/12/22 Ed: 2 Rev: 2013/09/10)*

These requirements cover cord-connected, indoor use, furniture power distribution units (FPDU) that consist of single or multiple outlet wiring devices that provide power for and are intended to be installed in commercial or household (residential) portable or stationary furnishings only. These units provide outlet receptacle(s) for computers, audio and video equipment, and other equipment that is mounted on or in commercial or household (residential) portable or stationary furnishings. Furniture power distribution units may also be provided with fuses or other supplementary overcurrent protection, switches, suppression components, EMI filters, uninterruptible power supplies, and/or indicator lights in any combination, or connections for cable communications, telephone and/or antenna.

FPDUs are intended to be directly connected to a permanently installed branch circuit receptacle. FPDUs are not intended to be series connected (daisy chained) to other FPDUs, re-locatable power taps, or to extension cords.

These requirements cover products rated 250 V AC or less and 16 A AC or less.

These requirements do not cover products for use in fixed furnishings.

Furniture power distribution units are not intended to function as general use re-locatable power taps.

A furniture power distribution unit that employs an electromagnetic interference filter shall also comply with the Standard for Electromagnetic Interference Filters, UL 1283.

A furniture power distribution unit that employs a transient voltage surge suppressor shall also comply with the Standard for Surge Protective Devices, UL 1449.

Telephone equipment and communication circuit protectors included in a furniture power distribution unit shall comply with the requirements in the Standard for Information Technology Equipment Safety - Part 1: General Requirements, UL 60950-1, and the requirements in the Standard for Secondary Protectors for Communications Circuits, UL 497A, respectively.

A furniture power distribution unit that incorporates an antenna discharge unit or provides antenna connections to a television, a high-voltage video product, or antenna shall comply with the applicable requirements in the Standard for Antenna-Discharge Units, UL 452, and the Standard for Audio-Video Products and Accessories, UL 1492.

A cord-connected product that employs ground-fault protection shall comply with the requirements in the Standard for Ground-Fault Circuit Interrupters, UL 943.

A product that employs an uninterruptible power supply shall comply with the requirements in the Standard for Uninterruptible Power Systems, UL 1778.

**UL 1286 – Office Furnishings** (*Issued: 2008/08/28 Ed: 5 Rev: 2013/09/19*)

These requirements cover office furnishing panels, study carrels, work stations, and pedestal-style systems that form an office furnishing system in accordance with the National Electrical Code, ANSI/NFPA 70. These are able to be provided with an electrical distribution system, including switches, convenience outlets, and channels for routing communication cables within system components separate from electrical raceways. Office furnishing systems include filing cabinets, desks, work surfaces, shelves, storage units, and similar items that have a particular electrical or mechanical function unique to an office furnishing system.

These requirements also cover lighting units intended to be mechanically attached to particular components within an individual device or office furnishing system.

These requirements also cover modular pre-wired office furnishing raceway wiring systems.

These requirements do not cover panels that are intended to penetrate the ceiling, or that are used to support the building structure.

*Tips for Ensuring a More Effective Safety Evaluation*

- Those new to the process of safety testing should consider conducting a preliminary design review, which provides a high level overview of your product and standard requirements.
- Ensure all critical components of the final products are listed / recognized by a Nationally Recognized Test Lab (NRTL). If components are not certified, the NRTL can perform limited component evaluations as part of the final end product as required.
- Purchase a copy of the standard and review it internally before seeking certification.
- Review the standards cautionary/warning requirements for your product to ensure they are met, as each standard has unique requirements.
- Have a user guide/installation manual ready to submit at the start of the evaluation.

## Appendix C – Flammability Testing

**Standards-Setting Organization** – American National Standards Institute (ANSI), National Fire Protection Agency (NFPA), Consumer Product Safety Commission (CPSC), and BUREAU OF ELECTRONIC & APPLIANCE REPAIR HOME FURNISHINGS & THERMAL INSULATION (BEARHFTI)

**Purpose of Testing** – Standards are designed to provide manufacturers and users with a common basis for evaluating the safety of a product's use in its intended marketplace.

### *Key Testing Standards, Protocols, & Equipment*

#### **16 CFR 1632 —Standard for the Flammability of Mattresses and Mattress Pads** (FF 4-72, Amended) (Latest Version: 1984)

This standard prescribes requirements for testing of prototype designs of mattresses and mattress pads before the sale in commerce or the introduction in commerce of any mattress or mattress pad which is subject to the standard. The standard prescribes a test to determine the ignition resistance of a mattress or a mattress pad when exposed to a lighted cigarette.

The standard sets forth a test at §1632.6 which may be used to classify ticking materials for resistance to cigarette ignition.

The standard sets forth a test at §1632.7 which may be used to demonstrate that the substitution of tape edge materials will not reduce the ignition resistance of a mattress prototype or a mattress pad prototype.

This is a smoldering source test on a mattress prototype. The method measures the ignition resistance of a mattress or mattress pad by exposing the surface to lighted cigarettes in a draft-protected environment. The surfaces to be tested include smooth, tape edge, and quilted or tufted locations, if they exist on the mattress or mattress pad surface. A two-sheet test is also conducted on similar surface locations. In the latter test, the burning cigarettes are placed between the sheets.

A minimum of 6 surfaces must be tested and pass the criteria\*. The criteria states: When testing the mattress or mattress pad surface in accordance with the testing procedure set forth in §1632.4 Mattress test procedure, individual cigarette test locations pass the test if the char length is not more than 2 inches (5.1 cm) in any direction from the nearest point of the cigarette. In the interest of safety, the test operator should discontinue the test and record a failure before reaching the 2 inch char length if an obvious ignition has occurred.

*\*Per an Interim Enforcement Policy issued May 15, 2006: "The Office of Compliance will exercise its enforcement discretion and permit manufacturers to reduce testing from six mattress surfaces to two mattress surfaces for each new prototype created to comply with the Open-Flame Standard. Thus, a prototype will be accepted if the char lengths of the 18 individual cigarettes are not more than two inches in any direction from the nearest point of the cigarette on two mattress surfaces. This policy applies only to mattress prototypes created after the March 15, 2006 publication of 16 C.F.R. Part 1633 in the Federal Register. Mattress prototypes created prior to March 15, 2006 are subject to the full requirements of Part 1632.*



**16 FR 1633 —Standard for the Flammability (Open Flame) Of Mattress Sets**  
(Latest Version: March 15, 2006)

This part 1633 establishes flammability requirements that all mattress sets must meet before sale or introduction into commerce. The purpose of the standard is to reduce deaths and injuries associated with mattress fires by limiting the size of the fire generated by a mattress set during a thirty minute test.

All mattress sets, as defined in §1633.2(c), manufactured, imported, or renovated on or after the effective date of this standard are subject to the requirements of the standard. One-of-a-kind mattress sets may be exempted from testing under this standard in accordance with §1633.13(c).

The requirements of this part 1633 shall apply to each “manufacturer” (as that term is defined in §1633.2(k)) of mattress sets which are manufactured for sale in commerce.

§1633.2(c): Mattress set means either a mattress and foundation labeled by the manufacturer for sale as a set, or a mattress labeled by the manufacturer for sale without any foundation.

This is an open flame test on a mattress prototype, which requires three samples of the same prototype to meet the test criteria. Criteria: (i) The peak rate of heat release shall not exceed 200 kilowatts (“kW”) at any time within the 30 minute test; and (ii) The total heat release shall not exceed 15 mega joules (“MJ”) for the first 10 minutes of the test.

*Test Duration: 30 minutes*

**California Technical Bulletin 133 —Flammability Test Procedure for Seating Furniture for Use in Public Occupancies**  
(Latest Version: January 1991)

This test procedure is designed to test seating furniture for use in occupancies that are identified as or considered to be public occupancies. Such facilities might include, but are not limited to, jails, prisons, nursing care homes, health care facilities, public auditoriums, hotels, and motels.

This test procedure is not intended to be used for the evaluation of residential furniture.

It is the intent of the Bureau that furniture complying with Technical Bulletin 133 be safer furniture when subjected to the ignition source specified by this test. This type of ignition may be typical of arson or incendiary fires or common accidental fires in public buildings. This Bureau expects manufacturers attempting to comply with this standard will also seek to make safer furniture, and will not attempt to compromise the intent of the standard in any manner.

Seating furniture fails to meet the requirements of this test procedure if any of the following criteria are exceeded in a room test using oxygen consumption calorimetry.

- A maximum rate of heat release of 80 kW or greater.
- A total heat release of 25 MJ or greater in the first 10 minutes of the test.

*Test Duration: 1 hour*

**California Technical Bulletin 117-2013 — Requirements, Test Procedure and Apparatus for Testing the Smolder Resistance of Materials Used in Upholstered Furniture**

*(Latest Version: June 2013)*

The intent of this standard is to produce upholstered furniture which is safer from the hazards associated with smoldering ignition. This standard provides methods for smolder resistance of cover fabrics, barrier materials, resilient filling materials, and decking materials for use in upholstered furniture.

- This is a fire-test-response standard.
- These test methods are designed for the assessment of the resistance of upholstered furniture component assemblies to combustion after exposure to smoldering cigarettes under specified conditions.
- The tests apply to upholstered furniture components - cover fabrics, barrier materials, resilient filling materials, and decking materials.
- The individual test methods and the materials to which they apply are as follows:
  - Cover Fabric Test - Applies to outer cover fabrics.
  - Barrier Materials Test - Applies to materials that are intended to serve as a barrier (interliner) between cover fabric and the resilient filling materials.
  - Resilient Filling Material Test – Applies to resilient filling materials used in upholstered seating furniture.
  - Decking Material Test – Applies to resilient materials used in the deck under loose cushions.
- This is a new standard that becomes effective in January 2015. Manufacturers are recommended to begin pursuing compliance with the new standard as soon as possible prior to the effective date.

**California Bill 1019**

*(Effective January 1, 2015)*

This standard follows up Technical Bulletin 117-2013 by mandating that manufacturers who do business in California are required to identify and label upholstered products that contain added flame retardants (FR) chemicals

**Boston Fire Department Regulation IX-10 — Regulation of Upholstered Furniture**

*(Latest Version: January 1995)*

This document describes the procedure by which upholstered furniture is regulated under the authority of the Fire Prevention Code. The component approval process is eliminated effective January 1, 1995. The Boston Fire Department Chair Test is no longer acceptable for approval purposes.

Test procedure is based on those found in California Technical Bulletin 133.

Boston Fire Department Seating Criteria (1) For Open Calorimeter Test Method:

- Rate of Heat Release: Shall not exceed 80 kW (kilowatts) during the entire test.
- Total Heat Release: Shall not exceed 25 MJ (mega joules) for the first 10 minutes or the time interval for the occurrence of the maximum rate of heat release.
- Total Mass Loss: Shall not exceed 3 pounds for the entire test.

*Test Duration: 1 hour*

**Boston Fire Department Regulation IX-11 —Mattress Fire Test**

*(Latest Version: September 1993)*

This fire test procedure is designed to evaluate mattresses intended for use in health care facilities, hotels and dormitories. The Boston Fire Department Regulatory Action of October 25, 1990 and subsequent revisions shall use this fire test method to prescribe performance requirements for mattresses, box springs, and bedding.

Performance criteria are provided in the Boston Fire Department Regulatory Action of November 12, 1991.

Boston Fire Department Regulatory Action of November 12, 1991 states: "Mattresses and mattress/box spring assemblies when tested in accordance with BFD IX-11 Mattress Fire Test (April 15, 1991) shall have limited rates of heat release, mass loss, and carbon monoxide generation as follows:"

- "The peak rate of heat release shall not exceed 150 KW
- The total heat released in the test shall not exceed 30 MJ for the first 10 minutes.
- The total mass loss shall not exceed the mass of the bedding used for the test.
- The maximum concentration of carbon monoxide in the room fire test shall not exceed 1,000 ppm for more than 5 minutes.

*Test Duration: 30 Minutes*

## **Appendix D – Environmental Testing**

**Standards-Setting Organization** – The Business and Institutional Furniture Manufacturers Association (BIFMA), American National Standards Institute (ANSI), and NSF International

**Purpose of Testing** – Standards are designed to provide manufacturers and users with a common basis for evaluating the environmental, health, and sustainable attributes of product and organizational claims

### *Key Testing Standards, Protocols, & Equipment*

#### **BIFMA e3-2014e Furniture Sustainability Standard**

This standard was created by a Joint Committee of BIFMA and NSF International and provides a pathway towards sustainability by establishing measurable market-based criteria to demonstrate sustainable attributes related to the manufacture of the product, the environmental impacts of the facility, and the business and social responsibilities of the organization. All business and institutional furniture can achieve certification with BIFMAe3 including, but not limited to, Moveable Walls, Systems Furniture, Desking Systems, Casegoods, Tables, Seating, and Accessories. Furniture manufacturers, their facilities in any country, and vendors may demonstrate compliance and thus third-party certification to BIFMAe3. This Standard addresses product-based characteristics in the general areas of materials, use of energy, human and ecosystem health, and social responsibility impacts. The credits and prerequisites in the standard consist of four basic elements: Materials, Energy and Atmosphere, Human and Ecosystem Health, and Social Responsibility.

#### **ANSI/BIFMA X7.1-2011**

This standard's test method recognizes furniture VOC emission concentrations, including Formaldehyde and Aldehydes, in newly- manufactured products.

#### **ANSI/BIFMA M7.1-2011**

This standard defines the acceptance VOC emission criteria for low-emitting VOC concentrations of newly-manufactured (furniture) products. This standard specifies accepted VOC emission concentration levels for individual compounds and total VOCs for low-emitting (furniture) products that have been selected for product certification or verification.

#### **Life Cycle Analysis (LCA)**

A LCA follows the boundary elements stated in ISO 14040 (Goal and Scope Definition) and ISO 14044 (Life Cycle Inventory). The Life-cycle analysis (LCA) allows third-party testing organizations to determine the environmental consequences of a product, from the extraction of raw materials to the disposal (from the extraction of raw materials, transportation to the manufacturing facility, manufacturing, delivery to the project, installation, useful life, removal, and transportation to the landfill or recycling facility). This is also called Cradle-to-Grave. The organization can determine the environmental consequences of a product including relative to the Earth (minerals), Water, Atmosphere (climate), and Health (eco-toxicity and human toxicity).

#### **Product Category Rule (PCR)**

The PCR provides the recipe to create the LCA study for the third party verification. PCR are documents that define the rules and requirements of the Environmental Product Declarations (EPD) for specific product categories and are vital in allowing for transparency and comparability between different EPDs that are based on the same PCR. (Example: BIFMA has written a Systems PCR. With this, different manufacturers can use the same PCR for different products to create the LCA. Once the LCA is created, the individual EPD can be developed for the specific product).

### **Environmental Product Declaration (EPD)**

Environmental Product Declarations are detailed reports on the environmental impact of products from a cradle-to-grave perspective (LCA) and other relevant information within the scope in accordance with ISO 14025 (Type III Environmental Declarations). The EPD is a registered trademark with the European Union.

### **Health Product Declaration (HPD)**

A standardized way for reporting material contents of building products and the health effects associated with these materials. HPDs are third party-verified to ensure transparency for data and information collected about the materials and potential hazards of the materials. HPDs include a full disclosure for the intentional ingredients and or known hazards within the materials of the product. Chemicals ingredients can be identified by working with the manufacturer's supply chain.

There are some organizations that can help with chemical transparency for HPDs. GreenWizzard can be used with LEEDv4, though the Green Screen Assessment Tool is included in LEEDv4 credit compliance.