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FEDERAL STANDARD

PERFORMANCE TEST METHOD FOR INTENSIVE USE CHAIRS

The General Services Administration has authorized the use of this federal standard by all federal agencies.

1. Scope. This test method describes procedures for evaluating performance characteristics of intensive use chairs. Intensive use chairs are designed to be used 24 hours per day, 7 days a week in intensive use environments

2. Summary of Method. Fixtures and equipment used in the ANSI/BIFMA X5.1 test method may generally be used in these tests. This performance test method for intensive use chairs differs from the ANSI/BIFMA X5.1 test method in the following ways:

In most cases higher performance values are required to ensure chair survivability in a severe use environment.

In some tests cyclic stepped loads are applied. This type of loading provides fatigue loading while keeping the total number of required cycles low by steadily increasing the load on the chair or chair component.

3. Definitions.

3.1 Disabling damage - Damage to the chair or component which prevents the chair or component from performing its intended functions or would in any way cause personal injury to the occupant or bystanders.

Beneficial comments, recommendations, additions, deletions or clarifications should be sent to the General Services Administration, Federal Acquisition Service, Engineering & Commodity Management (3QSAB).

FSC 7110

4. Description of Tests.

4.1 Cyclic Back and Back Tilt Mechanism Fatigue Test. Applies only to chairs with spring type tension controls. The entire chair shall be attached to a test platform via the base to prevent the chair from sliding backwards or overturning. Loads may be applied either with a pushing load-head or a pulling harness. A front-to-back load shall be applied to the back of the chair at a point 406.40mm above the seat or to the top of the back if the back is lower than 406.40mm. The load is applied in a manner so the load is normal to the plane of the back at the back stop position. The tilt mechanism shall be adjusted so that the top of the back moves 101.6mm ± 25.4mm rearward under the action of an 18.14kg load. The test is carried out at a 22.68kg load level at 20 cycles per minute and is continued until the back or tilt mechanism suffers disabling damage or meets the required acceptance level.

4.2 Cyclic Increasing Back Load Test. The entire chair shall be attached to a test platform via the base to prevent the chair from sliding or overturning. Loads may be applied either with a pushing load-head or a pulling harness. A front-to-back load shall be applied to the back of the chair at a point 406.40mm above the seat or to the top of the back if the back is lower than 406mm. The load is applied in a manner so the load is normal to the plane of the back at the back stop position. If the chair uses a spring type tension control, the control shall be adjusted to its loosest position. If the chair uses an air cylinder or other mechanism which locks the chair inclination in a fixed position, the control shall be adjusted to the far backward position. The test shall begin at the 34.02kg load level with the load increased in increments of 11.34kg after 25,000 cycles have been completed at the preceding load level. Testing continues until some type of disabling damage occurs or the chair meets the required acceptance level.

4.3 Cyclic Pneumatic Back Tilt or Seat Inclination Adjustment Mechanism Test. The entire chair shall be attached to the test platform via the base to prevent the chair from shifting position during the test. If a chair has a pneumatic back tilt or pneumatic seat inclination adjustment mechanism, they shall each be tested. The test shall use a four part cycle as follows:

- **A.** Seat and back is loaded with 22.68kg normal to the plane of the seat or back. The load shall be applied to the seat and the back at the location which will easily cause the seat or back to tilt when the tilt activator is operated.
- **B.** Load is removed.
- **C.** Load is reapplied and adjustment mechanism is activated while chair is under load.
- **D.** Load is removed and adjustment mechanism remains activated until seat or back mechanism returns to normal position whereupon the adjustment is inactivated.

The entire cycle is repeated at a rate of 5 cycles per minute. The test is continued until some part of the adjustment system malfunctions or the chair meets the required acceptance level.

4.4 Cyclic Vertical Load Test on One Arm. The entire chair shall be attached to a test platform via the base to prevent the chair from overturning. A vertical downward load shall be applied to the approximate center of one arm rest of a chair at a cyclic rate of 20 cycles per minute. The test is begun at a load level of 45.36kg and increased in increments of 22.68kg after 25,000 cycles have been completed at the preceding load level. Loads are increased every 25,000 cycles until the chair suffers disabling damage or meets the required acceptance level.

4.5 Cyclic Side Thrust Load Test on Arms. The entire chair shall be attached to a test platform via the seat to prevent it from sliding sideways, overturning or rotating in the direction of the load. The seat shall be restrained in a manner so that the arm is not supported. A cyclic outward side thrust load shall be applied to an arm of the chair at a rate of 20 cycles per minute. The load shall be applied to the approximate midpoint on the length of the arm normal to the vertical plane of the arm. The test shall be begun at the 22.68kg load level. Loads are increased in increments of 11.34kg after 25,000 cycles have been completed at each preceding load level. Loads are increased every 25,000 cycles until the chair suffers disabling damage or meets the required acceptance level.

4.6 Cyclic Vertical Load Test on Seats, Bases and Casters. The entire chair shall be attached to a test platform. The casters shall be prevented from rolling or rotating. A vertical load shall be applied to the seat at a rate of 20 cycles per minute. Loads are applied 50.8mm in front of the longitudinal axis of the spindle with a circular load-head 152.40mm to 203.20mm in diameter. The test is started at the 90.72kg load level and loads are increased in increments of 45.36kg after each 25,000 cycles have been completed at the preceding load level. The casters shall be turned at right angles to the legs so that all legs are subjected to tensional forces. Testing continues until some type of disabling damage occurs or the chair meets the required acceptance level.

4.7 Cyclic Fatigue Test of Swivel Bearings. The chair shall be secured to a platform that is rotated back and forth 360 degrees each cycle. The platform is cycled 10 times per minute. A static load of 90.72kg is placed on the chair so that its center of gravity is located 101.6mm in front of the longitudinal axis of the spindle. The load is increased every 25,000 cycles by 11.34kg. The rotating platform secured to the chair base is rotated beneath the seat side of the chair control while the seat side of the control is loaded vertically and secured to prevent it from rotating. The amount of torque required to cause the chair to rotate from a stopped position is measured every 25,000 cycles. The static load is also applied when the torque measurement is taken. The testing is continued until the torque rises above the acceptance level or the chair completes the required load level in the acceptance level.

4.8 Cyclic Pneumatic Height Adjustment Durability Test. The entire chair shall be attached to a test platform via the base to prevent the chair from shifting position during the test. The height adjustment mechanism shall be tested using a four part cycle as follows:

- **A.** Seat is loaded with 113.40kg.
- **B.** Load is removed.
- **C.** Load is reapplied and adjustment mechanism is activated.
- **D.** Load is removed and adjustment mechanism remains activated until seat ascends to highest position whereupon it is inactivated.

The entire cycle is repeated at a rate of 5 cycles per minute. The test is continued until some part of the adjustment system malfunctions or the chair meets the required acceptance level.

4.9 Front Stability Test. The front stability test shall be conducted as follows:

- **A.** Chair is placed on a level test platform at lowest height setting.
- **B.** The base and casters are placed in their most unstable position.
- **C.** A downward vertical load is applied 60 mm from the front center edge of the seat. The load in kg required to just lift the rear caster off the test platform is recorded as the measure of front stability.

4.10 Back Stability Test. The back stability test shall be conducted as follows:

- **A.** Chair is placed on a level test platform at lowest height setting.
- **B.** The base and casters are placed in their most unstable position.
- **C.** A 25.4mm high obstruction is placed behind the two rearward casters.
- **D.** The front edge of the seat is loaded with 22.68kg applied in a similar manner as in the front stability test.
- **E.** A horizontal front-to-back load is applied to the top of the back rest. The force required to overturn the chair multiplied by the height from the floor to the top of the backrest is recorded as the measure of back stability.

4.11 Caster and Base Durability Test. A chair with casters mounted shall be placed on the obstacle layout as indicated in Figure 1. A 136.08kg load shall be applied to the chair seat as indicated in Figure 1 with the chair spindle fully extended. The chair seat shall be attached to a mechanical device which shall exert a horizontal push and pull of from 762.00mm to 863.60mm as illustrated in the figure. The base and casters shall be free to rotate and swivel. The machine shall operate continuously at a rate of 8 to 10 cycles per minute with a maximum speed of 15.24m per minute. One cycle shall consist of a forward and backward stroke of the mechanical device.

Testing continues until the base or a caster suffers structural breakage, loss of serviceability, failure that would in any way cause personal injury to the occupant or bystanders, or meets the required acceptance level.

4.12 Fabric Durability Test. The fabric shall be tested in accordance with the surface abrasion test in ASTM D 3597 or ASTM D 3884 (using CS #10 wheels and a 500 gram load). If the ASTM D 3597 surface abrasion test method is used, the bidder must extend a 5 year (from receipt of chair) warranty on the fabric life. If the fabric wears through while in the anticipated intensive use environment during the warranty period, the contractor shall supply a complete re-upholstery kit as defined in the contract, (for COM, the customer shall specify the desired durability of the fabric).

4.13 Spindle Attachment Tests (does not apply to taper fit designs). The base and spindle shall be detached from the chair and tested as follows:

Test A) Apply a torque of 30.48m-kg to turn or displace the spindle, from the base by use of a tool such as a wrench.

Test B) Apply a force of 680.39kg to the spindle, in the direction of its removal from the base at the rate of 2.54mm to 3.17mm per minute.

When a free swiveling fitting is used to attach the spindle**, t**o the base, Test A may be disregarded.

5. Acceptance Levels.

Test	**Acceptance Level**
4.1 Cyclic Back and Back Tilt Mechanism Fatigue Test	5,000 cycles
4.2 Cyclic Increasing Back Load Test	Complete 79.38kg Load Level
4.3 Cyclic Pneumatic Back Tilt or Seat Inclination Adjustment Mechanism Test	360,000 Cycle for backrest < 406.40mm 332,000 Cycles for backrest > 406.40mm
4.4 Cyclic Vertical Load Test on One Arm	Complete 113.40kg Load Level
4.5 Cyclic Side Thrust Load Test on Arms	Complete 90.72kg Load Level
4.6 Cyclic Vertical Load Test on Seats, Bases and Casters	Complete 589.67kg Load Level

4.7 Cyclic Fatigue Test of Swivel Bearings	Max. 3810.00mm/kg at 136.08kg Load Level
4.8 Cyclic Pneumatic Height Adjustment Durability Test	125,000 cycles
4.9 Front Stability Test	Min. 56.70kg
4.10 Back Stability Test	Min. 657.71kg/mm.
4.11 Caster and Base Durability Test	36,000 cycles
4.12 Fabric Durability Test	ASTM D 3597 - 30,000 cycles without any noticeable wear. ASTM D 3884 –15,000 cycles without wearing completely through any warp or fill yarn.
4.13 Spindle Attachment Tests	Spindle shall remain unmoved after completion of Test A and Test B.

6. Reporting Requirements. Upon completion of each test, the official report (Form A) must be completely filled out and documented with photographs as required.

7. References. The following documents of the issues in effect on date of invitation for bids or requests for proposal form a part of this specification to the extent specified herein.

American National Standards Institute (ANSI) Standards:

ANSI/BIFMA X5.1 - General-Purpose Office Chairs - Tests

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

American Society for Testing and Materials (ASTM) Standards:

ASTM D 3597 - Woven Upholstery Fabrics - Plain, Tufted or Flocked

ASTM D 3884 - Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

Preparing Activity:
GSA/FAS/3QSAA

FORM A. Report of Furniture Performance Test.

Date:

Manufacturer:

Manufacturer's Model No.: _____

_____

_____

Name of test performed (submit original photograph of Test Set-up with specimen in place taken before testing began.) _____

_____

Last successful load level: _____

Other relevant information: _____

_____

_____

_____

_____

_____

Testing Laboratory _____

Laboratory technician _____ Title _____

Signature _____

Certified by _____ Title _____

Signature _____