

**SPECIFICATIONS  
FOR  
CHAIRS, ERGONOMIC**



(This specification is released for procurement purposes until revised or rescinded.)

**SCOPE**

This specification covers ergonomic chairs for use by state agencies and institutions for a workforce that falls within the 20<sup>th</sup> to 80<sup>th</sup> percentile normal population distribution. Ergonomic chairs are characterized by the multiple comfort adjustments it provides. The adjustments serve to minimize the adverse effects on the body from sitting for long periods of time.

It is the intent of this specification to procure only recognized quality, extended duty (up to 10 hours of seating a day, 260 days per year minimum), commercial grade chairs. Chairs, which in the sole judgement of the state are judged to be of poor design and manufacture are unacceptable and the state reserves the right to reject chairs on that basis.

For the variety of chairs listed below, Production Option means a supplier chooses which design type to manufacture. Class 2 is preferred but Class 1 is acceptable and you do not have to offer both designs.

**I. CLASSIFICATION**

**Category I - Regular Size (up to 300 lbs)**

**Type I - Independently Adjustable Seat Pitch And Back Position**

**Class 1 - Pneumatic Seat And Back Operation (Production Option)**

Size 1 Task/Operator

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Class 2 - Spring/Tension Seat And Back Operation (Production Option)**

Size 1 Task/Operator

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Type II - Synchronized Seat And Back Movement**

**Class 1 - Pneumatic Seat And Back Operation (Production Option)**

Size 1 Task/Operator

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Class 2 - Spring/Tension Seat And Back Operation (Production Option)**

Size 1 Task/Operator

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Category II - Large Size, Extra Heavy Duty (up to 500 lbs)**

**Type I - Independently Adjustable Seat Pitch And Back Position**

**Class 1 - Pneumatic Seat And Back Operation (Production Option)**

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Class 2 - Spring/Tension Seat And Back Operation (Production Option)**

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Type II - Synchronized Seat And Back Movement**

**Class 1 - Pneumatic Seat And Back Operation (Production Option)**

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Class 2 - Spring/Tension Seat And Back Operation (Production Option)**

Size 2 Supervisor/Manager

Size 3 Manager/Executive

**Category III - Regular Size**

Identical to Category I except has structural plastic base.

**Category IV - Large Size, Extra Heavy Duty**

Identical to Category II except has structural plastic base.

## **II. Applicable Standards**

Reference to specifications, standards, test methods and other documents shall be to the issues in effect on the date of the Invitation for Bids. Copies of the referenced documents may be obtained from the issuing organizations at the addresses shown. The following publications form a part of this specification to the extent specified herein:

ANSI/BIFMA X 5.1(2002): Tests For General Purpose Office Chairs  
American National Standards Institute  
1430 Broadway, NY NY 10018

ASTM D 3574: Method of Testing Flexible Cellular Materials: Slab, Bonded and Molded Urethane Foams.

ASTM D 3770: Standard Specification for Flexible Cellular Materials: High-Resilience Polyurethane Foams.

ASTM D 4157: Method of Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method).

ANSI Z34.2, Self-Certification by Producer or Supplier

Federal Specification: Superintendent of Documents, US Government Printing Office, Washington, DC 20402

TT-C-490: Cleaning Methods of Ferrous Surfaces and Pretreatments for Organic Coatings  
A-A-2235: Chairs, Rotary (Office, Ergonomic, Upholstered)

ANSI/HFS 100-2002: American National Standard For Human Factors Engineering Of VDT Workstations

UFAC Voluntary Action Program  
Upholstered Furniture Action Council  
Box 2436, High Point, NC 27261

California Technical Bulletin No. 117  
State Of California Bureau Of Home Furnishings, Sacramento, California

New York Ports Authority Flammability Regulations  
State Of New York, New York, NY

Boston Fire Code  
Boston Fire Department, Boston, MA

## **III. Requirements**

### **A. General**

It is the intent of this specification to offer the end user the broadest possible selection of chairs meeting the requirements of this specification. This division, at its sole discretion, may reject any line, or series, of chairs that it deems insufficient to meet this requirement. End user demand, sufficient competition, product value plus appropriate design and function also contribute to all final decisions. Novel and atypical designs must demonstrate production stability for consideration.

You are required to supply a minimum number of chair configurations. Failure to do so will prevent you from being added to the Qualified Product Listing even if your products meet the minimum qualifications. The State of North Carolina prefers that you be able to supply all four categories however that is not mandatory. For each category you choose, you may elect to produce and supply either a Class 1 or Class 2 (preferred) control. However, you must be capable of supplying both Types and all Sizes within a given Category. All chair measurements must be made and advertised per the guidelines set by ANSI/HFS standards.

All dimensions listed are associated with large, sometimes cumulative, tolerances. This is especially true for dimensions that include soft and irregular shaped surfaces. If you have a concern about your product not complying with the dimensions listed in this document, please contact our office for assistance. You will likely have to forward an engineering drawing with dimensions and associated production tolerances for approval consideration.

Common Ergonomic Chair Attributes: Fabric types and colors, seat style (width and depth) and contour, backrest width and height and contour, lumbar support, headrest, seat height adjustment range, seat slider, asynchronous seat /back tilt, 2:1 synchronous back/seat tilt, tilt lock, floating backrest with tension control, 360 degree seat swivel, adjustable height/width arms, various caster types, base diameter and material type. Other not so obvious attributes include seat and back pan materials, foam(s) under the fabric and weight limit of a particular chair. Not all chairs will have all of these attributes. Stools may be derived from ergonomic chairs by adding foot rings, changing height control cylinders and deleting arms and adding caster locks as required.

Chairs offered under this specification shall be of the manufacturer's standard production and shall be offered to the general public. Any deviation from standard manufacture, specifically for the State of NC, is prohibited. Descriptive literature and a published suggested retail price list, coinciding with the series offered, must be available upon request. The published price list must show all models and associated options offered. No marked up literature is allowed and all approved products must have been in production for at least one (1) year at the time of evaluation.

## **B. Requirements For All Chairs**

1. Base – Chairs shall have a 360-degree swivel base with a 5 leg minimum “star” configuration. Base shall be free of sharp edges. The base shall be high strength, heavy duty, cast or die formed aluminum alloy as well as welded steel tube arms, with decorative cover (where specified or available), having a minimum of 16-gage material (5/8” minimum cross section). Alternately, the entire base may be of solid injection molded plastic, color impregnated, ABS (Acrylonitrile Butadiene Styrene) for 300 lb chairs or injection molded, glass reinforced nylon (polyamide) thermoplastic, for 500 lb chairs, with a minimum vertical static load capacity of 2,500 pounds and 3,000 pounds respectively. Metallic surfaces shall be scuff and oxidation resistant. An optional chrome or polished aluminum finish, when so specified in the invitation for bids, shall be available as well as a powder coated paint finish. Polished chrome footplates shall be available when requested. Contrasting colors must exhibit good art. The diameter of the base shall be a minimum of 25” (radius measured centerline of cylinder to center line of caster shaft) for Category 1 and 3 chairs and a minimum of 27” for Category 2 and 4 chairs.
2. Adjustment Mechanisms - All adjustment controls shall be permanently identified with Icons or raised symbols and readily viewable and user accessible to the occupant and easily operated to execute the adjustment(s) while seated. A control that requires simultaneous adjustment of the seat pitch and back tilt angles of type I chairs is not acceptable. The seat tension adjustment device must be easy to turn and must be operated using a hard plastic or metal wheel with 4 or more grip knob projections of 1/8” minimum height and a minimum outside diameter of 2 ½ inches.
3. Seat Construction - The inner shell (pan) shall be constructed of preformed plywood or a composite material. The inner shell shall be covered with a good grade of contoured foam, a minimum of 2 1/2” thick that is comfortable to the occupant and will not deteriorate or lose its resiliency during the warranty period. The foam shall meet the requirements of California Technical Bulletin 117. The seat shall have a "waterfall" or "roll-off" front edge. The upholstery shall be wrinkle free. Seat pan covers are optional but wood pans must be covered with a decorative paper as a minimum.
4. Back Construction –

Classic: The inner shell (pan) shall be constructed of preformed wood, plastic or metal material. The inner shell shall be covered with a good grade of foam, a minimum of 2” thick, which is comfortable to the occupant and will not deteriorate or lose its resiliency during the warranty period. The foam shall meet the requirements of California Technical Bulletin 117. The upholstery shall be wrinkle free and there shall be no sharp edges on any moldings of the outer pan. The back shall be contoured to include a lumbar region for support of the occupant's lower back. The back may be finished with a plastic pan or fabric.

New Era: The back may be constructed with an open weave fabric absent of any foam or upholstery suspended by a smooth supporting frame. The open weave, often referred to as mesh, must provide comfort and durability equal to the offerings of a classic shell, foam and fabric design. The open area of a mesh material shall be no

more than 50%, equally distributed over the entire area, and no less than 40%. Durability and flammability test reports, along with warranty information, must accompany any new model presented to the State of North Carolina for consideration.

Backs must exhibit some type of over-run safety device to prevent accidental disengagement of the back from the base. Additionally, with the seat in its lowest position and at maximum rear tilt, the back adjustment bar must not hit or fall between the legs of the base to prevent the seat from rotating when in its lowest position.

5. Arms - Arms shall meet the prescribed tests for arms. They shall be designed to give comfortable support to occupant's arms and not interfere with proper placement of the chair in the workstation. Top of arm surface shall be made of resilient material, and shall be durable and soft in the occupant's arm contact area. Adjustable height arms shall be adjustable in even increments for each arm. Arms are a standard offering.

All chairs must be available with adjustable height and width arms. All adjustment knobs, except for the tension adjustment knob, must be at least 2" diameter and easy to access and manipulate by smaller persons. Fixed arms, however, must be available when specified on an order. The use of screws substituted for adjustment knobs is not allowed.

6. Casters - All chairs shall be standard with dual-wheel casters capable of being replaced. Carpet, hard floor and ESD wheels shall be available with optional manual lock specified in bid. For BIFMA tests, the manufacturer's standard caster shall be used. Poorly designed and manufactured casters that exhibit excessive clearances and wobble and or make annoying noise on hard surfaces during movement are not acceptable.
7. Pneumatic Cylinders - All pneumatic cylinders shall be of Suspa, Stabilus or equal in performance and durability and suitable for the category of chair intended. Any cylinder must have a 4" minimum extension range.
8. Workmanship - All chairs shall demonstrate the use of good materials and workmanship, upholstery materials shall be well tailored, and seams and welts shall be smooth and straight. All other construction shall demonstrate the use of good processes and practices of fabrication and assembly. There shall be no sharp corners or edges that could cause injury to persons or damage to clothing. Pull-string upholstery technique must be securely stapled around the pattern or nested in a dedicated recess. All fasteners must have lock washers. Assembly lubricants that can come in contact with clothing during normal chair use are not acceptable. Best engineering practices must be followed for both design and manufacturing of chairs.
9. All chairs must come with indelible instructions, permanently attached to the right arm of the chair and readable while sitting, on how to properly adjust the various controls to achieve maximum comfort and proper support for the end user. The same instructions should also include any cautions and/or warnings (including weight limits) about using the chair plus a toll free phone number for technical support. The State encourages the use of bar code labels for inventory tracking. Label to be on bottom of seat pan and on an easily accessible flat surface.

## C. Specific Requirements for each Type

### Category I Chairs

#### 1. Type I & III, Independent Seat & Back Pitch Adjustment

The type I mechanism shall provide the following adjustments:

- a) Seat height: Shall adjust and lock in an infinite number of positions through a minimum range of 4 inches (16" to 20.0" typical) when measured in accordance with ANSI/HFS 100-1988.
- b) Seat Angle: Shall adjust and lock independently of back tilt and shall provide a negative (forward) seat pitch angle of 3 degrees nominal, and a backward tilt of 7 degrees nominal. The seat pan shall lock in place at any angle within the range that the seat will tilt.
- c) Back Angle: Shall adjust independently of the seat pitch and tilt at least 10 degrees but no more than 20 degrees. The back shall lock in position at any angle throughout the range that it will move. The back must not tilt more than 30 degrees backwards when measured from the centerline of the height control cylinder.

- d) Back Height: Shall adjust up and down to provide positive support for the lumbar region of the occupant's back. A ratchet type adjustment is preferred. Other types must not allow the back strap to become trapped between the base spokes when the chair and back are at their lowest positions and back is reclined.
- e) Free Float: Allows the back of the chair to move freely and maintain contact with the occupant's back with the seat tilt angle lever locked in place. The back shall float through the entire range of positions that the back tilt angle can be locked. An adjustable tension control device shall support the back.

## 2. Type II & IV, Synchronized Seat & Back Pitch Adjustment

The type II mechanism shall provide the following adjustments:

- a) Seat Height: Shall adjust and lock in an infinite number of positions through a minimum range of 4 inches (16" - 20.0" typical) when measured in accordance with ANSI/HFS 100-1988.
- b) Seat Pitch And Back Tilt Angle: Shall be synchronized to a ratio of approximately 2:1 and shall provide a rearward back tilt angle of 10 – 30 degrees when measured from the centerline of the height control cylinder.
- c) With the seat pan tilted fully forward, the chair back shall not constrain the upper torso to a position forward of vertical.
- d) Lock In Place: Adjustment shall be provided to lock the seat and back in place at any angle within the range that the seat will tilt.
- e) Free Float: Allows the back and seat to move freely in synchronization throughout the entire range that the seat will tilt.

## 3. Class 1 - Pneumatic Seat And Back Operation

The back and seat tilt operations shall be accomplished by the use of pneumatic cylinders. The seat height adjustment shall be accomplished by the use of a pneumatic cylinder

## 4. Class 2 – Spring Tension Seat And Back Operation

The back and seat tilt operations may be accomplished by the use of a spring or other tension-type mechanism. The seat height adjustment shall be accomplished by the use of a pneumatic cylinder.

### **Category II Chairs**

## 1. Type I, Independent Seat & Back Pitch Adjustment

The type I mechanism shall provide the following adjustments:

- a) Seat Height: Shall adjust and lock in an infinite number of positions through a minimum range of 16" to 20.0" when measured in accordance with ANSI/HFS 100-1988.
- b) Seat Angle: Shall adjust and lock independently of back tilt and shall provide a negative (forward) seat pitch angle of 3 degrees nominal, and a backward tilt of 7 degrees nominal. The seat pan shall lock in place at any angle within the range that the seat will tilt.
- c) Back Angle: Shall adjust independently of the seat pitch and tilt at least 10 degrees but no more than 20 degrees. The back shall lock in position at any angle throughout the range that it will move. The back must not tilt more than 30 degrees backwards when measured from the centerline of the height control cylinder.
- d) Back Height: Shall adjust up and down to provide positive support for the lumbar region of the occupant's back. A ratchet type adjustment is preferred. Other types must not allow the back strap to become trapped between the base spokes when the chair and back are at their lowest positions and back is reclined.

e) Free Float: Allows the back of the chair to move freely and maintain contact with the occupant's back with the seat tilt angle lever locked in place. The back shall float through the entire range of positions that the back tilt angle can be locked. An adjustable tension control device shall support the back.

2. Type II, Synchronized Seat & Back Pitch Adjustment

The Type II mechanism shall provide the following adjustments:

- a) Seat Height: Shall adjust and lock in an infinite number of positions through a minimum range of 16" - 20.0" when measured in accordance with ANSI/HFS 100-1988.
- b) Seat Pitch And Back Upright Tilt Angle: Shall be synchronized to a ratio of approximately 2:1 and shall provide a rearward back tilt angle of 10 – 30 degrees when measured from the centerline of the height control cylinder.
- c) With the seat pan tilted fully forward, the chair back shall not constrain the upper torso to a position forward of vertical.
- d) Lock In Place: Adjustment shall be provided to lock the seat and back in place.
- e) Free Float: Allows the back and seat to move freely in synchronization throughout the entire range that the seat will tilt.

3. Class 1 - Pneumatic Seat And Back Operation

The back and seat tilt operations shall be accomplished by the use of pneumatic cylinders. The seat height adjustment shall be accomplished by the use of a pneumatic cylinder.

4. Class 2 - Spring/Tension Seat And Back Operation

The back and seat tilt operations may be accomplished by the use of a spring or other tension-type mechanism. The seat height adjustment shall be accomplished by the use of a pneumatic cylinder.

**Category III Chairs**

This category has the same requirements as **Category I** Chairs but the base is a molded structural plastic component.

**Category IV Chairs**

This category has the same requirements as **Category II** Chairs but the base is a HD molded structural plastic component.

**D Dimensional Requirements**

**Category I and III Chairs - Regular Size**

Note: Dimensions shown are in inches and considered typical.

<u>Dimension</u>	<u>Size 1</u>	<u>Size 2</u>	<u>Size 3</u>
Seat Cushion Width	18"	19"	20"
Seat Cushion Depth	16"	17"	18"
Back Cushion Height	13"	16"	19"
Back Cushion Width	16"	17"	18"
Distance Between Arms	18"	19"	20"

**Category II and IV Chairs - Large Size, Extra Heavy Duty**

Note: Dimensions shown are in inches and considered typical.

<u>Dimension</u>	<u>Size 2</u>	<u>Size 3</u>
Seat Cushion Width	21"	23" and larger

Seat Cushion Depth	17"	20" and larger
Back Cushion Height	20"	23" and larger
Back Cushion Width	20"	21" and larger
Distance Between Arms	21"	23" and larger

**E. Intended Use**

1. Type I, III Chairs

A chair intended for use by persons assigned to "heavy" VDT workloads (more than 4 hours per day) or "moderate" VDT workloads (2 to 4 hours per day). This style chair is also appropriate for most general desk type work whether or not the work involves the use of a VDT (video display terminal or computer).

2. Type II, IV Chair

A chair intended primarily for intensive use by law enforcement centers.

**IV. Warranty**

Chairs furnished under this specification shall be new and shall be guaranteed against defects in materials, workmanship, and performance in accordance with the manufacturer's standard warranty, except that in no event shall such coverage be for less than five (5) years for structural parts (arms and base), mechanisms, cylinders, casters and controls, and three (3) years for upholstery materials. Warranty coverage shall begin on the date of delivery to the ordering agency. Warranty service shall be available on site at any location within the State of North Carolina, and defective units shall be repaired or replaced during the warranty period at no cost to the owner or his representative within 5 calendar days.

**V. Service, Parts, And Manuals**

Complete instructions for operating all adjustments shall be furnished with each chair.

**VI. Acceptance Evaluation And Quality Assurance**

- All chairs offered must pass the following ANSI/BIFMA X5.1 tests outlined below. Prospective bidders are required to make available, when requested, certified test results from a nationally recognized testing facility for the representative model chair in the series offered. Manufacturers who are self certified and comply with ANSI Z34.2; Self Certification by Producer or Supplier must also make their test results available when requested.

**Required ANSI/BIFMA X5.1 Tests**

ANSI/BIFMA Section No.	Test Description	Type I Independent	Type II Synchronous
5	Back Pull - Tilt Chairs		X
6	Back Pull - Back Tilt Chairs	X	
8	Base	X	X
9	Drop	X	X
10	Swivel Cycling	X	X
11	Tilt Mechanism		X
12	Seating Impact	X	X
13	Stability	X	X
14	Arm Strength - Vertical	X	X
15	Arm Strength - Horizontal	X	X
16	Back Durability - Tilting Seat		X
17	Back Durability - Non-Tilting Seat	X	
18	Caster/Chair Base Durability	X	X

- All chairs shall meet one of the following flammability requirements:

A) UFAC Voluntary Action Program

- B) California Technical Bulletin No. 117
- C) New York Ports Authority Flammability Regulations
- D) Boston Fire Code

Bidders are required to designate their standard and furnish certification of compliance of flammability to this office when requested.

**VII. Delivery And Payment**

Delivery of and payment for chairs under this specification shall be in accordance with the terms and conditions of the invitation for bids. The contractor shall be responsible for any packing, packaging, or protection required to insure delivery in an undamaged condition. All delivery related packaging to be removed from sites(s) upon completion of job.

**VIII. Ordering Data (For Purchase & Contract Use Only)**

Purchasers should exercise any desired option offered herein and should specify the following in the invitation for bids:

- 1. Title, number, and date of this specification.
- 2. The type, class, and size of chairs required. (See Section I. Classification)
- 3. Fabric type, color and pattern where applicable.
- 4. If casters are to be other than dual-wheel carpet casters.
- 5. Any other option offered by the manufacturer.

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