

Test Report For:
ANSI/BIFMA X5.1-2017
General-Purpose Office Chairs



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Date Received: 1/9/2018
Date(s) Tested: 1/9/2018 – 2/26/2018

Description of Test Samples:

Model / Part Number:
Condition of Item Sample: New Production

- Sample 1: 5" Cylinder
- Sample 2: 5" Cylinder
- Sample 3: 5" Cylinder
- Sample 4: 4" Cylinder
- Sample 5: 4" Cylinder
- Sample 6: 4" Cylinder
- Sample 7: 5" Cylinder - New Mech Components
- Sample 8: 5" Cylinder - New Mech Components
- Sample 9: 5" Cylinder - New Mech Components
- Sample 10: 5" Cylinder - Aluminum Base

Lab Technician(s): Derek Libbert

Work Requested / Applicable Documents:

Determine if the submitted test samples meet the acceptance level criteria of the applicable test standard(s):

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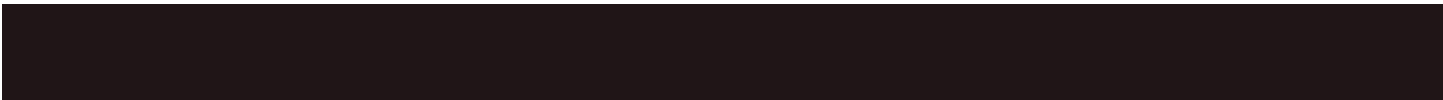
<u>Test No.</u>	<u>Test Description</u>	<u>Sample No.</u>	<u>Results</u>
5.0	Backrest Strength Test – Static – Type I and II	2	Passed
7.0	Drop Test – Dynamic	1, 8b, 10a	Passed
8.0	Swivel Test – Cyclic	1	Passed
9.0	Tilt Mechanism Test – Cyclic	7	Passed
10.0	Seating Durability Test – Cyclic	4, 9	Passed
11.0	Stability Test	1	Passed
12.0	Arm Strength Test – Horizontal – Static	6	Passed
13.0	Backrest Durability Test – Cyclic – Type I	6	Passed
14.0	Backrest Durability Test – Cyclic – Type I	2	Passed
16.0	Caster/Chair Base Durability Test – Cyclic	3	Passed
20.0	Arm Durability Test – Cyclic	6	Passed

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<u>Test No.</u>	<u>Test Description</u>	<u>Sample No.</u>	<u>Results</u>
7.0	Base Test	6, 10b	Passed

Conclusion:

The submitted sample(s) met the acceptance criteria of the tests listed above.



1. Backrest Strength Test – Static – Type I and II:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 5.

Notes:

- Temperature / Humidity: 67°F / 40 RH%.
- Tilt tension: Midpoint.
- Tilt lock: Disengaged.
- Chair height: Midpoint.
- Loads were applied at a 70 degree angle to the backrest at its fully tilted position, centered 16 inches above the seat.
- Functional load: 150 lbs. for 1 minute.
- Proof load: 225 lbs. for 1 minute.
- See Photo 1 for set up.



Specimen	Load (lbs.)	Time (sec.)	Observation
2	150	60	No loss of serviceability.
	225	60	No sudden and major change in structural integrity of chair.

Acceptance Level:

Functional Load: There shall be no loss of serviceability to the chair.

Proof Load: There shall be no sudden and major change in the structural integrity of the chair.
 Loss of serviceability is acceptable.

Equipment:	Test Machine (TM-008.4), Tape Measure (TD-002), CMD (TD-006), Stop Watch (TD-008.11), Digital Level (TD-021)
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2. Drop Test – Dynamic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 7.

Notes:

- Temperature / Humidity: 68°F / 39 RH%.
- Tilt tension: Midpoint.
- Load dropped from a height of 6 inches through a 16 inch diameter bag.
- Functional load: 225 lbs.
- Proof load: 300 lbs.
- See Photos 2 & 3 for set up.



Specimen	Chair Height	Load (lbs.)	Observation
1	Maximum	225	No loss of serviceability.
	Maximum	300	No sudden and major change in structural integrity of chair.
	Minimum	225	No loss of serviceability.
	Minimum	300	No sudden and major change in structural integrity of chair.

Acceptance Level:

Functional Load: There shall be no loss of serviceability to the chair.

Proof Load: There shall be no sudden and major change in the structural integrity of the chair.
 Loss of serviceability is acceptable.

Equipment:	Tape Measure (TD-002), Weight Bags (WB25)
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3. Drop Test – Dynamic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 7.

Notes:

- Temperature / Humidity: 70⁰F / 39 RH%.
- Tilt tension: Midpoint.
- Load dropped from a height of 6 inches through a 16 inch diameter bag.
- Functional load: 225 lbs.
- Proof load: 300 lbs.
- See Photos 4 & 5 for set up.



Photo 4



Photo 5

Specimen	Chair Height	Load (lbs.)	Observation
8b	Maximum	225	No loss of serviceability.
	Maximum	300	No sudden and major change in structural integrity of chair.
	Minimum	225	No loss of serviceability.
	Minimum	300	No sudden and major change in structural integrity of chair.

Acceptance Level:

Functional Load: There shall be no loss of serviceability to the chair.

Proof Load: There shall be no sudden and major change in the structural integrity of the chair.
 Loss of serviceability is acceptable.

Equipment:	Tape Measure (TD-002), Weight Bags (WB25)
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4. Drop Test – Dynamic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 7.

Notes:

- Temperature / Humidity: 69⁰F / 42 RH%.
- Tilt tension: Midpoint.
- Load dropped from a height of 6 inches through a 16 inch diameter bag.
- Functional load: 225 lbs.
- Proof load: 300 lbs.
- See Photos 6 & 7 for set up.



<u>Specimen</u>	<u>Chair Height</u>	<u>Load (lbs.)</u>	<u>Observation</u>
10a	Maximum	225	No loss of serviceability.
	Maximum	300	No sudden and major change in structural integrity of chair.
	Minimum	225	No loss of serviceability.
	Minimum	300	No sudden and major change in structural integrity of chair.

Acceptance Level:

Functional Load: There shall be no loss of serviceability to the chair.

Proof Load: There shall be no sudden and major change in the structural integrity of the chair.
 Loss of serviceability is acceptable.

Equipment:	Tape Measure (TD-002), Weight Bags (WB25)
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5. Swivel Test – Cyclic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 8.

Notes:

- Temperature / Humidity: 68 - 71°F / 38 - 52 RH%.
- Tilt tension: Midpoint.
- The base was cycled 360 degrees with 270 lbs. loaded on the seat, 2 inches in front of the spindle. The chair was cycled in both the maximum and minimum seat height settings.
- Test rate: 13 cpm.
- See Photos 8 & 9 for set up.



<u>Specimen</u>	<u>Chair Height</u>	<u>Cycles</u>	<u>Observation</u>
1	Maximum	0	Test began at the highest position.
		60,000	No loss of serviceability.
	Minimum	60,000	Test continued at the lowest position.
		120,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability to the chair.

Equipment:	Test Machine (TM-001), Tape Measure (TD-002), Stop Watch (TD-008.10), Weight Bags (WB10, WB50)
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6. Tilt Mechanism Test – Cyclic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 9.

Notes:

- Temperature / Humidity: 68 - 70°F / 37 - 52 RH%.
- Tilt tension: Midpoint.
- Chair height: Midpoint.
- The tilt mechanism was cycled from all the way forward to all the way rearward and back while 240 lbs. was resting in the seat.
- Test rate: 19 - 20 cpm.
- See Photo 10 for set up.



Specimen	Load (lbs.)	Observation
7	0	Test began.
	300,000	No loss of serviceability, tilt mechanism still functional.

Acceptance Level: There shall be no loss of serviceability to the tilt mechanism.

Equipment:	Test Machine (TM-011.2), Tape Measure (TD-002), Stop Watch (TD-008.11), Digital Level (TD-021), Weight Bags (WB05, WB10, WB25, WB50)
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7. Seating Durability Tests – Cyclic – Center Impact:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 10.3.

Notes:

- Temperature / Humidity: 68 - 71°F / 38 - 52 RH%.
- A 125 lb. load was dropped through a 16 in. diameter bag from 1.4 in. above uncompressed seat surface. The bag was placed 0.5 inches forward the backrest and centered side to side.
- Test rate: 24 - 27 cpm.
- See Photo 11 for set up.



Photo 11

Specimen	Load (lbs.)	Cycles	Observation
4	125	0	Test began.
	125	100,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability to the chair after completion of both the impact and load-ease tests. If applicable, the chair base (center structure) shall not touch the test platform as a result of the impact loads.

Equipment:	Test Machine (TM-004), Tape Measure (TD-002), Stop Watch (TD-008.13)
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8. Seating Durability Tests – Cyclic – Front Corner Load Ease:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 10.4.

Notes:

- Temperature / Humidity: 70 - 71°F / 38 - 42 RH%.
- Two 200 lb. loads were applied alternately through 8 inch load pads positioned at the front corners of the seat, flush with the load bearing surface to the front and sides.
- Test rate: 11 - 12 cpm.
- See Photo 12 for set up.



Specimen	Load (lbs.)	Cycles	Observation
4	200	0	Test began.
	200	20,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability to the chair after completion of both the impact and load-ease tests. If applicable, the chair base (center structure) shall not touch the test platform as a result of the impact loads.

Equipment:	Test Machine (TM-012.1 & TM-012.2), Tape Measure (TD-002), Stop Watch (TD-008.10)
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9. Seating Durability Tests – Cyclic – Center Impact:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 10.3.

Notes:

- Temperature / Humidity: 69 - 70°F / 37 - 52 RH%.
- A 125 lb. load was dropped through a 16 in. diameter bag from 1.4 in. above uncompressed seat surface. The bag was placed 0.5 inches forward the backrest and centered side to side.
- Test rate: 22 - 24 cpm.
- See Photo 13 for set up.



Specimen	Load (lbs.)	Cycles	Observation
9	125	0	Test began.
	125	100,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability to the chair after completion of both the impact and load-ease tests. If applicable, the chair base (center structure) shall not touch the test platform as a result of the impact loads.

Equipment:	Test Machine (TM-004), Tape Measure (TD-002), Stop Watch (TD-008.13)
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10. Seating Durability Tests – Cyclic – Front Corner Load Ease:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 10.4.

Notes:

- Temperature / Humidity: 69⁰F / 41 - 43 RH%.
- Two 200 lb. loads were applied alternately through 8 inch load pads positioned at the front corners of the seat, flush with the load bearing surface to the front and sides.
- Test rate: 18 - 19 cpm.
- See Photo 14 for set up.



<u>Specimen</u>	<u>Load (lbs.)</u>	<u>Cycles</u>	<u>Observation</u>
9	200	0	Test began.
	200	20,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability to the chair after completion of both the impact and load-ease tests. If applicable, the chair base (center structure) shall not touch the test platform as a result of the impact loads.

Equipment:	Test Machine (TM-012.1 & TM-012.2), Tape Measure (TD-002), Stop Watch (TD-008.10)
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11. Stability Test – Rear Stability:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 11.

Notes:

- Temperature / Humidity: 68°F / 40 RH%.
- Type III rear stability performed with 6 discs in seat, force applied to front of top disc, tilt lock fully engaged in upright position.
- Type III rear stability force: 1.1 (47 – H). The load shall not be less than 20.9 lbs.
- Type I rear stability performed with 13 discs in seat, tilt lock disengaged.
- Seat height (H): 23.75 inches.
- See Photos 15 & 16 for set up.



Specimen	Direction	Required Force (lbs.)	Achieved Force (lbs.)	Observation
1	Rear Type III	25.9	> 25.9	The chair did not tip over.
	Rear Type I	NA	NA	The chair did not tip over.

Acceptance Level: The chair shall not tip over.

Equipment:	Tape Measure (TD-002), Support Fixture (TD-010), Force Gauge (TD-011), Stability Disks (TD-013), Digital Level (TD-021)
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12. Stability Test – Front Stability:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 11.

Notes:

- Temperature / Humidity: 68^oF / 40 RH%.
- Vertical force: 135 lbs. was hung 2.4 in. back from the front of the seat pan.
- Horizontal force: 4.5 lbs. level with seat pan.
- See Photo 17 for set up.



<u>Specimen</u>	<u>Direction</u>	<u>Required Force (lbs.)</u>	<u>Achieved Force (lbs.)</u>	<u>Observation</u>
1	Front	4.5	> 4.5	The chair did not tip over.

Acceptance Level: The chair shall not tip over as the result of the (4.5 lb.) force application.

Equipment:	Tape Measure (TD-002), Force Gauge (TD-011), Weight Scale (TD-020), Digital Level (TD-021)
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13. Arm Strength Test – Vertical – Static:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 12.

Notes:

- Temperature / Humidity: 71⁰F / 38 RH%.
- Loads were applied using a 5 inch adapter positioned at the weakest position of the armrest.
- Functional load: 169 lbs. held for 1 minute.
- Proof load: 253 lbs. held for 15 seconds.
- See Photo 18 for set up.



Specimen	Load (lbs.)	Time (sec.)	Observation
6	169	60	No loss of serviceability.
	253	15	No sudden and major change to the chair.

Acceptance Level:

Functional Load: There shall be no loss of serviceability. For a height adjustable arm, failure to hold its height adjustment position to within 6 mm (0.25 in.) from its original set position as the result of the loading is considered a loss of serviceability.

Proof Load: There shall be no sudden and major change in the structural integrity of the chair. For a height adjustable arm, a sudden drop in height of greater than 25 mm (1 in.) does not meet this requirement. Loss of serviceability is acceptable.

Equipment:	Test Machine (TM-008.2), Tape Measure (TD-002), Stop Watch (TD-008.11), Digital Level (TD-021)
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14. Arm Strength Test – Horizontal – Static:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 13.

Notes:

- Temperature / Humidity: 71⁰F / 38 RH%.
- Loads were applied at the weakest position of the armrest.
- Functional load: 100 lbs. held for 1 minute.
- Proof load: 150 lbs. held for 15 seconds.
- See Photo 19 for set up.



Photo 19

<u>Specimen</u>	<u>Load (lbs.)</u>	<u>Time (sec.)</u>	<u>Observation</u>
6	100	60	No loss of serviceability.
	150	15	No sudden and major change to the chair.

Acceptance Level:

Functional Load: A functional load applied once shall cause no loss of serviceability.

Proof Load: A proof load applied once shall cause no sudden and major change in the structural integrity of the unit. Loss of serviceability is acceptable.

Equipment:	Test Machine (TM-008.2), Tape Measure (TD-002), Stop Watch (TD-008.11), Digital Level (TD-021)
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15. Backrest Durability Test – Cyclic – Type I:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 14.

Notes:

- Temperature / Humidity: 70 - 71°F / 38 - 52 RH%.
- Tilt tension: Midpoint.
- Chair height: Midpoint.
- Tilt lock: disengaged.
- A 100 lb. force was applied at the specified location of the backrest at a 90 degree angle to the backrest, 16 inches above the seat. A 240 lb. load was placed in the seat.
- 80,000 cycles at the center of the back, 20,000 cycles 4” left of center, and 20,000 cycles 4” right of center.
- Test rate: 22 - 25 cpm.
- See Photos 20 & 21 for set up.



Photo 20



Photo 21

Specimen	Segment	Cycles	Observation
2	Center	0	Test began at the center on the backrest.
		80,000	No loss of serviceability.
	4” left	80,000	Test continued offset to the left on the backrest.
		100,000	No loss of serviceability.
	4” right	100,000	Test continued offset to the right on the backrest.
		120,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability.

Equipment:	Test Machine (TM-008.4), Tape Measure (TD-002), CMD (TD-006), Stop Watch (TD-008.11), Digital Level (TD-021), Weight Bags (WB05, WB10, WB25, WB50)
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16. Caster/Chair Base Durability Test – Cyclic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 16.

Notes:

- Temperature / Humidity: 69 - 71⁰F / 38 - 52 RH%.
- The casters are required to carry the weight of the chair plus 270 lbs.
- The specimen was cycled over three 0.125” obstacles for 2,000 cycles. The obstacles were then removed and the chair was cycled over a smooth surface for the duration of the test. After the cycles were complete, each caster was subjected to a 5 lb. caster retention test.
- Test rate: 8 - 9 cpm.
- See Photos 22 & 23 for set up.



Specimen	Segment	Cycles	Observation
3	Obstacles	0	Test began over obstacles.
		2,000	No changes.
	Smooth Surface	2,000	Test continued over smooth surface.
		100,000	No loss of serviceability.
	Pull Force	N/A	Each caster exceeded the 5 lb. caster retention requirement.

Acceptance Level: There shall be no loss of serviceability. No part of the caster shall separate from the chair as a result of the application of the 22 N (5 lbf.) force.

Equipment:	Test Machine (TM-007), Tape Measure (TD-002), Stop Watch (TD-008.13), Force Gauge (TD-011), Weight Scale (TD-020), Obstacles (TD-028), Weight Bags (WB01, WB05, WB10, WB25, WB50)
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17. Arm Durability Test – Cyclic:

Testing was performed per ANSI/BIFMA X5.1 – 2017, Section 20.

Notes:

- Temperature / Humidity: 71⁰F / 46 - 52 RH%.
- A force of 90 lbs. was applied to each arm simultaneously at an initial 10⁰ to the arm through a 4 inch loading device.
- Test rate: 22 - 24 cpm.
- See Photo 24 for set up.



<u>Specimen</u>	<u>Force (lbs.)</u>	<u>Cycles</u>	<u>Observation</u>
6	90	0	Test began.
	90	60,000	No loss of serviceability.

Acceptance Level: There shall be no loss of serviceability to the chair.

Equipment:	Test Machine (TM-003), Tape Measure (TD-002), Stop Watch (TD-008.13), Digital Level (TD-021)
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18. Base Test - Static:

Testing was performed per ANSI/BIFMA X5.1 – 2011, Section 7.

Notes:

- Temperature / Humidity: 70°F / 40 RH%.
- Casters were removed from stems; each stems was then inserted into the base.
- 2,500 lbs of force was applied for 1 minute, then released.
- 2,500 lbs of force was applied a second time for an additional minute, then released.
- See Photo 25 for set up.



Photo 25

<u>Specimen</u>	<u>Load (lbs.)</u>	<u>Time (sec.)</u>	<u>Observation</u>
6	2,500	60	No sudden and major change in structural integrity.
	2,500	60	No sudden and major change in structural integrity.

Requirement: There shall be no sudden and major change in the structural integrity of the base.
The center column may not touch the test platform during the load applications.

Equipment:	Test Machine (TM-005), Stop Watch (TD-008.10)
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19. Base Test - Static:

Testing was performed per ANSI/BIFMA X5.1 – 2011, Section 7.

Notes:

- Temperature / Humidity: 70⁰F / 42 RH%.
- Casters were removed from stems; each stems was then inserted into the base.
- 2,500 lbs of force was applied for 1 minute, then released.
- 2,500 lbs of force was applied a second time for an additional minute, then released.
- See Photo 26 for set up.



Photo 26

<u>Specimen</u>	<u>Load (lbs.)</u>	<u>Time (sec.)</u>	<u>Observation</u>
10b	2,500	60	No sudden and major change in structural integrity.
	2,500	60	No sudden and major change in structural integrity.

Requirement: There shall be no sudden and major change in the structural integrity of the base.
The center column may not touch the test platform during the load applications.

Equipment:	Test Machine (TM-005), Stop Watch (TD-008.13)
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