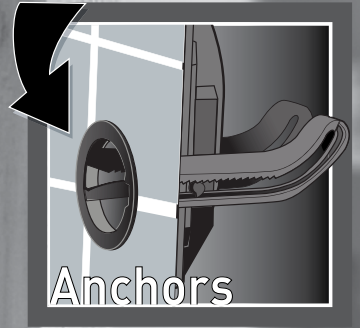


SecureMount™



**Easy, Secure Install —
Anywhere on the Wall™!**

SecureMount™ Anchors Testing Report

Independently tested by CSA and NAHB laboratories to exceed ADA, ASTM, ANSI and CSA standards.

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Goals:

Ensure the SecureMount™ Anchor grab bar installation system will perform securely and safely in the field if installed to specifications.

Testing was completed in two phases.

- Phase One with pre-production anchors:
 - Understand how the product performs installed in various substrates and orientations.
 - Subject the bar to a variety of stresses and loads to simulate real world use.
 - Identify design and installation issues prior to final tooling.
- Phase Two with production anchors:
 - Substantiate marketing claims for loads, substrates and usage.
 - Final prove out of the design, installation and performance of the anchor.

Test Locations:

Testing was performed at 4 different facilities.

- Moen® Internal Reliability Lab – North Olmsted, Ohio
- CSA OnSpex™ – Cleveland, Ohio
- Bureau Veritas – Buffalo, NY
- NAHB Research CenterSM – Upper Marlboro, MD

Summary of testing performed:

- Static Load Testing - apply an incremental load on the grab bar and anchors in various substrates and installation orientations. The load is applied to failure.
- Codes and Standards Testing - ensure the installed anchors meet all applicable building codes/standards found in ANSI, CSA, ASTM and ADA building code.
- Cycle Testing - Simulated daily use and the presumed load the anchors will see over an installed lifetime.
 - o 100K cycles in two vectors at 60 lbs of force
 - o 1000K cycles in 4 vectors at 250 lbs of force
- Impact Testing - Determine the impact force the anchors can withstand installed in various dry wall thicknesses.
- Effects of Humidity - perform a static load and cycle test on a bar installed in various humidity and temperature conditions.
- Mis-Installation Testing - understand the performance of the anchors when installed incorrectly.

1. Determine the actual load/impact applied

to installed anchors. (See Figure 1)

- a. Purpose: To determine what load the anchors actually see in the event of a slip or fall.
- b. Method: 20 men and women of varying weights were tested. Each subject performed the test three times for a total of 60 data points.
 - i. They were instructed to reach and grasp a mounted grab bar as quickly as possible.
 - ii. They maintained their grip on the grab bar for 3 seconds.
 - iii. They were lying on their backs reaching upwards for the bar. This put the maximum impact and static load on the bar.
 - iv. The initial impact and sustained loads were measured.
- c. Conclusions: The testing indicated that 95% of the population cannot apply a force greater than 80% of their body weight. If we claim the anchors can be used by persons up to 300 lbs. then all testing must show the installed anchors can support a

minimum load of 240 lbs. We have chosen to have a 20% safety factor and require a minimum of 300 lbs. of load to pass testing.

2. Static Load Testing (See Figure 2)

- a. Purpose: To determine how the installed anchors will perform in various substrates and installation orientations.
- b. Method: An incremental load was applied to the bar until the anchors failed. Failure is defined as catastrophic breakage or pull out of the anchor. Note: in all cases the drywall failed and the anchor pulled out – at no time was there any damage to the anchor itself.
 - i. Testing was performed at BV, CSA OnSpex and North Olmsted
 - ii. Drywall sections were installed on a wood frame (the sizes of the drywall panels varied between the different test labs) to ASTM C840-04A drywall installation standards.
 - iii. The load applied was either done on an instron machine or physically by adding increased weights to the bar.
 - iv. Load was added until the drywall failed.
 - v. Static load testing was done in various substrates:
 - 1. 3/8", 1/2" and 5/8" drywall. Drywall used was bare (no paint, wallpaper, etc.) to test to the weakest condition.
 - 2. 1/2" and 5/8" drywall with 4x4" tile and 12x12" marble
 - 3. 1/8" tub surround
 - 4. 1/2" green drywall
 - vi. Static load testing was also done in various installed bar and anchor orientations.
 - vii. All substrates and orientations were subjected to a downward load and a pull away load.
- c. Results:
 - i. 3/8" drywall met our testing requirements but we have decided not to claim 3/8" drywall because of limited market size.
 - ii. 1/2" bare drywall exceeded 300 lbs. in every test when the anchors were properly installed. The overall average of all tests and in various properly installed orientations was 366 lbs.
 - iii. 5/8" bare drywall exceeded 300 lbs. in every test when the anchors were properly installed. The overall average of all tests and in various properly installed orientations was 617 lbs.
 - iv. The performance ability of the drywall increases as substrates are added – tile, marble, etc.
 - v. 1/8" tub surround met the requirements. The test stand capacity maxed out at 450 lbs.
 - vi. 1/2" green drywall exceeded 300 lbs. requirements.
- d. Conclusions:
 - i. The anchor meets all static load requirements in all tested substrates with various anchor and bar orientations.

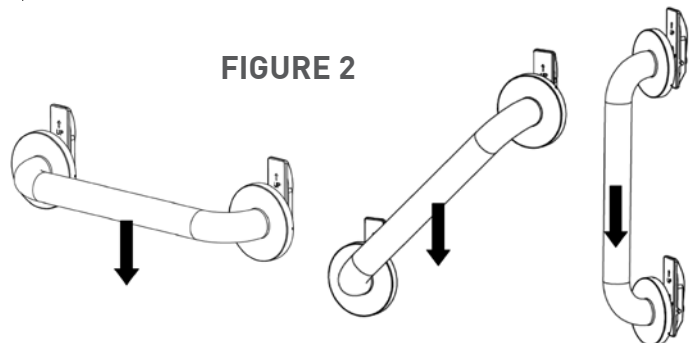
3. Codes and Standards Testing (See Figure 3)

- a. Purpose: Local, State or Federal building codes generally callout installation specifications for grab bars. We performed testing to ensure the SecureMount™ Anchors meet applicable codes and standards.
- b. Method:
 - i. Testing was performed at CSA OnSpex, North Olmsted and NAHB Research Center.
 - ii. We tested to the following standards:
 - 1. CSA B45 and B651- apply a test load of 292 lbs. in the center of the bar over a 30 minute period and hold for

FIGURE 1



FIGURE 2



5 minutes. Bars are tested in both the vertical and horizontal position.

2. ASTM F446 85 - gradually apply a load of 250 lbs. continuously over the center of the bar. Load is applied for 30 minutes. Bars were tested in both the vertical and horizontal position.
3. ANSI A117.1- Apply a load of 250 lbs. anywhere on the bar and hold for 30 minutes. We applied the weight as close to the end of the bar as possible so there was no dispersion of the load. The anchors were therefore subjected to the worst case condition.
4. ADA U.S. Department of Justice Guidelines - Bar must withstand 250 lb. load.
5. ANSI/BHMA A156.16 - By default we also comply with the ANSI/BHMA standard (BHMA-Builders Hardware Manufacturers Association).

iii. Testing was performed in:

1. 1/2" and 5/8" drywall
2. 1/8" tub surround
3. 1/2" green board
4. By default all other substrates attached to drywall also meet these standards - tile, marble, etc.

c. **Results/Conclusions:** The requirements were exceeded in all substrates and bar orientations.

4. Cycle Testing

a. **Purpose:** To ensure the installed anchors will perform in real world daily use. Cycle testing simulates the daily use over a long period of time to ensure the performance of the anchor is not degraded.

b. **Method:**

- i. Two cycle tests were performed on the anchors.
 1. 60 lbs. force for 100K cycles: Based on Mil-Std-1472D stating that the maximum force applied for adult males in a medium traction environment is 45 lbs.
 - Bars were tested in the horizontal orientation and a load was applied in downward force and a pull away force. Ultimately one installed bar was used for both tests so the anchors actually saw 200k cycles.
 - Testing was done in 1/2" and 5/8" drywall.
 2. 250 lbs. of force for 1000 cycles: Based on U.S. standards of 250 lbs.
 - Bars were tested in the horizontal orientation and a load was applied in four vectors - down, up, away and 45° downward.
 - Each load was applied for 250 cycles for a total of 1000 cycles.
 - Testing was done in both 1/2" and 5/8" drywall.

c. **Results:** SecureMount™ Anchors met all cycle test requirements in both 1/2" and 5/8" drywall.

d. **Conclusion:** The SecureMount™ Anchors are able to withstand the rigors of daily use in drywall. It is assumed that all other substrates added to drywall will also meet all cycle test requirements.

5. Impact Testing (See Figure 4)

- a. **Purpose:** This test was designed to simulate the real world condition of a consumer slipping in the tub and falling onto or pulling down on the grab bar.
- b. **Method:**
 - i. Drywall was mounted to a wood frame and grab bars were installed per ASTM C840-04A drywall installation standards.
 - ii. The impact force was derived from load x height. A set load was dropped from a set height to create the force on the installed anchors.
 - iii. The testing was done on bars installed in the horizontal orientation.
 - iv. Impact force was applied in the downward and pull away directions.
 - v. Testing was done in both 1/2" and 5/8" drywall.
- c. **Results:**
 - i. 1/2" drywall - impact force applied at 600 lbs. downward force and 700 lbs. pull away force.
 - ii. 5/8" drywall - impact force applied at 900 lbs. downward force and 1450 lbs. pull away force.
- d. **Conclusion:** Based on the research and testing done by North Olmsted reliability, the speed a human can grip and hold a bar will never allow a load greater than 120% of the person's body weight to be applied. 95% of the population will apply only 80% of their body weight. Therefore the performance of the bars far exceeds any real world load that would be seen during a slip or fall.

6. Effects of Humidity:

- a. **Purpose:** To ensure the installed anchors will continue to perform in drywall that had been exposed to high humidity/ high temperature similar to a tub or bathroom area.
- b. **Method:** The bars were installed into drywall and placed in a temperature/humidity controlled chamber. Bars were subjected to cycle testing and static load testing.
 - i. Cycle testing: 60 lb. load applied and cycled 100 times.
 - ii. Static load: 300 lb. load applied and held for 30 minutes.
 - iii. Testing was done in 1/2" and 5/8" bare drywall and 1/2" tiled drywall.
- c. **Results:** All testing passed.
- d. **Conclusion:** The installed anchors will continue to meet requirements in a high humidity bathing area.

7. Mis-Installation or Unusual Installation Testing: (See Figure 5)

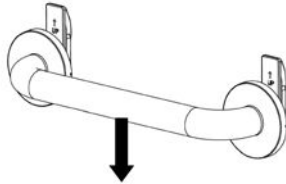
- a. **Purpose:** A variety of tests were performed to ensure that the anchors would still perform safely if installed without following the installation instructions or installed in unusual configurations.
- b. **Method:** A cross-functional team met to determine as many mis-installation events as possible. All mis-installations were static load tested to failure. Installations included:
 - i. Anchor and guide installed upside down

FIGURE 3

Structural Strength Code Requirements	CSA B45-02 Plumbing Fixtures	CSA B651 Barrier Free Design	ANSI A117.1 Accessible and Usable	ASTM F 446-85 Grab Bars and Accessories in the bathing area	ADA Standards for Accessible Design DOJ 28 CFR part 36	SecureMount™ Anchor "tested up to"
	292 lbf (1.3 kN)	292.25 lbs. (1.3 kN) applied in any direction	Vertical or horizontal force of 250 lbs. (1112 N) is applied at any point on the grab bar	Shall support a static load of at least 250 lbf (1.1 Kn)	Shall support a static load of at least 250 lbf (1.1 Kn)	
Substrate						
3/8" Drywall	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	322 lbs.
1/2" Drywall	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	382 lbs.
5/8" Drywall	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	540 lbs.
1/2" Green board	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	401 lbs.
1/8" Tub surround	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	450 lbs.
1/2" Drywall with 4x4 tiles	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	735 lbs.
5/8" Drywall with 4x4 tiles	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	769 lbs.
1/2" Drywall with 12x12 tiles	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	879 lbs.
5/8" Drywall with 12x12 tiles	292 lbs.	292 lbs.	250 lbs.	250 lbs.	250 lbs.	1000 lbs. +

- ii. Anchor installed in all other orientations behind the wall to simulate shifting of the anchor during installation
- iii. Anchor installed partially in a stud
- iv. Installed on a drywall seam
- v. Installed with one anchor in drywall and one anchor in a stud

FIGURE 4

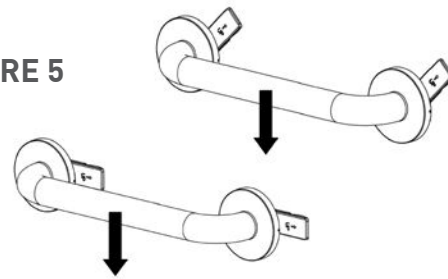


- c. **Results:** The anchors installed upside down and partially in stud went to 292 lbs. All other installations exceeded the 300 lbs. static load requirement.
- d. **Conclusions:** The anchors will still perform safely if installed in incorrect or unusual configurations.

Testing Results Summary

- 1. Static Load Testing
 - a. Static Load Average test performance in 1/2":
 - i. Vertical - 342 lbs.
 - ii. Horizontal - 391 lbs.
 - iii. 45° - 389 lbs.
 - b. Static Load Average test performance in 5/8":
 - i. Vertical - 620 lbs.
 - ii. Horizontal - 520 lbs.
 - iii. 45° - 710 lbs.

FIGURE 5



- c. Static Load Average test performance with secondary substrates:
 - i. 1/2" with 4x4 tile - 592 lbs.
 - ii. 1/2" with 12x12 marble - 1000 lbs.
 - iii. 5/8" with 4x4 tile - 1180 lbs.
 - iv. 5/8" with 12x12 marble - 1728 lbs.
 - v. 1/8" tub surround - 450 lbs.
- 2. Code and Standards Testing:
 - a. 250 lbs. - 292 lbs. held for 30 minutes based on standards requirements.
- 3. Cycle Testing:
 - a. 200,000 cycles at 60 lbs. of force in two orientations
 - b. 1000 cycles at 250 lbs. of force in 4 orientations
- 4. Impact Testing:
 - a. 1/2" drywall with a horizontal bar
 - i. 600 lbs. downward load
 - ii. 700 lbs. pull away load
 - b. 5/8" drywall with horizontal bar
 - i. 900 lbs. downward (max load applied in one test was 1075 lbs.)
 - ii. 1450 lbs. pull load (max load applied in one test was 1500 lbs.)

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