COMPARISON of GRAB BAR FASTENING SYSTEMS in HOLLOW WALL STRUCTURE

Fastener Ratings – the WingIt Grab Bar Fastening System is the only fastening system that is tested and rated at the projection off the wall surface of Grab Bars (up to 3" off the wall surface). Other fastening systems measure sheer values – **E.g. a fastener with a max load sheer value of 380 # is reduced below 20# working load with the torque created 3" off the wall surface**.

The Grab Bar WingIt works on the same premise as the aerospace WingIt we are developing. The WingIt is made to be used in substrate materials that are strong in compression – e.g. drywall has about 6X and composites about 10X the compressive strength compared to their tension strength.

The WingIt was developed to satisfy two key elements of Blind Fastening:

Efficiency of Force Distribution –
Beyond the integrity of a fasteners' structure, it is the fasteners ability to extract force efficiencies from a substrate. This is equivalent to:

- The area of the substrate put under compression.
- The amount of compression exerted without affecting the substrate.
- How efficiently it is put under compression (stability).

Environmental Stability –
The installed fastening system has a specific level of initial structural integrity, maintaining that integrity in the substrate is the Environmental Stability. The simplest way to test stability is to subject the fastening system, in torque, to moment forces via multiple vector and vibratory forces. This will determine the ability of the fasting system to withstand *Shift*. *Shift* is the initial movement of any fastener from its "set" position that will affect the fastening system's integrity and lead to the fastening systems failure.

FASTENER	**WingIt**	**All Toggle® Types**	**Shields**
AREA OF COMPRESSION	Entire area over a 3" diameter.	Area under toggle to grab bar flange, until grab bar flange shifts – then forces become tension.	None – all Tension forces.
COMPRESSION /TENSION RATIO	High compression / Low Tension	Low Compression / High Tension	N/A all forces at aperture
FASTENERS EFFICIENCY OF COMPRESSIVE FORCES	HIGH – Heavy duty stainless face plate, combined with tubular spacer and DuroA85 padded wing tips – distribute forces efficiently without creating any individual high pressure points.	Dependant on the grab bar flange to create any compression. Steel shoe on the interior of the substrate can compress the substrate causing system failure.	No compressive forces, all tension.
APERTURE SOLIDIFICATION	Forces distributed from spacer greater than 1sq." – Total solidification.	None. 5/8" diameter apertures are created with no means of viable solidification	All force extraction is from friction created in the aperture – totally unstable.

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FASTENING SYSTEM TYPE	Self contained, Fastening system tightens onto itself. Waterproofing and structural capabilities are achieved simply by installing fastening system.	Dependant on the grab bar flange to be an integral part of the fastening system. Forces exerted on the grab bar effect the system's integrity. Not waterproof.	Depends on the grab bar flange to be an integral part of the fastening system. Forces exerted on the grab bar effect the system's integrity. Not waterproof.
EFFECT ON DRYWALL or TILE	Substrate becomes stronger and more stable where WingIts are installed. Tile has even forces over a large area and is completely protected by the 3M® waterproofing material.	Weakens drywall substrate. Tile applications are subject to individual points of high pressure leading to cracking.	Weakens drywall substrate. Tile applications are subject to high incidence of breakage due to shield forces at the aperture.
WATERPROOF	Self-waterproofing – as it is installed. Stainless construction.	Three 5/8" apertures left in the substrate must be caulked.	Three 1/2"+ apertures left in the substrate must be caulked.
ENVIRONMENTAL STABILITY	Solidification of the aperture and high compression ratios make for a stable system. This system minimizes torque, moment, and vector forces. The self contained aspect of the WingIt means that directional or vibratory forces applied to the grab bar have little or no effect on the stability of the fastening system. The wing assembly's creation of a conical shape within the hollow of the wall allows the fastening system to be subjected to multiple vector forces and vibratory forces without having the "shift" commonplace in all other fastening systems.	No aperture solidification and lack of waterproof capabilities, along with high tension forces create a system that may be initially stable but will fatigue. The fastening systems' reliance on the mounting flange of the grab bar as an integral part of its structure – subjects the fastener to shift and fatigue. The singular plane of the fastening system subjects it to directional forces and moment – allowing for shift in the fastening system.	All forces are tension, created from the apertures. This system has very little integrity. The fastening systems' reliance on the mounting flange of the grab bar as an integral part of its structure – subjects the fastener to shift and fatigue. The singular plane of the fastening system subjects it to directional forces and moment – allowing for shift in the fastening system.
Cycle testing* of grab bars installed in ½" drywall with 4" wall tile.	**Surpassed 1,000 cycles! (1)**	Fatigue began between 1 and 16 cycles. Used standard toggle and Super Toggler® types.	Fatigue occurred between <1 and 2 cycles

***** Cycle testing is comprised of - Load mechanism is attached to 3 ½" center section of a grab bar. Grab bar is subjected to 250# loads in four different directions (random vectors) per cycle; inspection for permanent degradation of the fastening system's integrity. Common failures were: complete breakage, tile cracking and loosening of the fastening system. **(1)** – WingIts were checked after each of the first ten cycles then every 100 cycles. WingIts have been tested up to 10,000 cycles.

Compiled by WingIt Innovations – the Solutions Company