



MiTek®

Residential Hold-Down Systems

Engineering New Zealand (ENZ) published an article (February 2022) outlining potential issues with residential hold-down systems. The article mentioned the BOWMAC screw bolt, GIB HandiBrac® and GIB EzyBrace® Systems. We add the following context and comments.

Whilst we agree the load path is of fundamental importance for any structural design, construction in accordance with the non-specific design Standard for Light timber Framed Buildings NZS 3604:2011 has proven redundancies meaning that imposed loads are shared to multiple members. This allows for proprietary solutions (such as wall bracing) to be used in conjunction with the Standard and additional design for a direct load path is not always required.

High-performance bracing elements, such as GIB® 'H-type' GSP-H, BL1-H, BLG-H and BLP-H, require special hold-down fixings at the panel ends to keep the studs anchored and to stop the panel from 'tipping'. These elements are often placed near a slab edge, and for panel hold-down fixings we recommend the GIB Handibrac® with a M10 x 140 mm long BOWMAC screw bolt. Expanding concrete anchors are often not suitable near a slab edge, and a further advantage of the screw bolt is that it can also be used on a timber platform. Other elements, such as plywood bracing panels, often require similar hold-down fixings. NZS3604:2011 specifies a minimum bolt characteristic value of 15 kN for concrete floors and 12 kN for timber floor platforms. Over-strength is specified to ensure that bracing is governed by panel performance and not by hold-down fixings withdrawal. The M10 x 140 screw bolt is an integral part of the GIB Handibrac® hold down system and shouldn't be treated as an isolated component requiring its own specific engineering design (SED).

Concrete slabs

A marginal situation arises when hold-down bolts are specified on internal walls with a minimum 100 mm slab thickness. The BOWMAC screw bolt embeds 90 mm into the concrete and the recommended drill depth is 96 mm. Care is required to ensure that the pre-drilled hole does not penetrate the slab. This can be done by taping the drill bit so that a maximum depth is not exceeded. Accidentally penetrating the slab does not affect structural performance of the bolt but might damage the damp-proof membrane.

Our advice to designers is to carefully consider placement of bracing elements. Single storey NZS 3604 buildings tend to have low to moderate bracing demand and we suggest that bracing elements requiring hold-down bolts are specified as much as possible on external walls. Specify moderately rated elements such as GS1-N, GS2-N and GS2-NOM internally as these are easy to install, permit bracing to be distributed over a larger area, and don't require special hold-down fixings. If higher-rated elements are required on some internal walls, then localised slab thickening can be factored into the design.

For the lower of two-storey NZS 3604 buildings, high-performance elements can be specified on external and loadbearing internal walls, where slab thickening is already a requirement, with the remainder as outlined above for single storey structures.



Insulated pod-type proprietary waffle slabs have varying topping thickness and this can affect the specification and layout of bracing elements. GIB® and MiTek NZ will be carrying out further testing, and the results are expected to be available in a few months. We expect good outcomes for common slab thicknesses less than 100 mm, given that the published characteristic strength represents an assumed worst-case scenario of installation in header blocks.

Timber floors

The use of 12 kN hold-down fixings has for many decades been part of NZS 3604 construction. Before the introduction of solutions such as the GIB HandiBrac® and BOWMAC screw bolt, common construction consisted of nominally 6 and 12 kN rated metal straps, either directly connecting studs to floor framing or indirectly by wrapping straps around the bottom plate and adding a 12 kN bolt fixing. Some strap fixing details showed slots through flooring to provide direct stud connection to floor framing. Straps must be properly checked in and following drying shrinkage straps can prove less effective and develop a bulge behind wall linings. Current bracket and bolt solutions are much more effective, elegant, and user-friendly, but do not increase previously accepted forces on foundations.

In addition, and where no limits existed previously, NZS 3604-2011 has reduced the maximum BU rating for bracing elements on timber platforms to 120 BU/m, placing a cap on associated uplift forces. NZS 3604 provisions consider redundancies that exist in light timber framed construction, and adherence to the details contained in that Standard and associated manufacturer's literature is critical to ensuring compliance. Further, buildings constructed in accordance with NZS 3604 are deemed to comply with NZBC Clause B1-Structure via Acceptable Solution B1/AS1. Unless there are specific circumstances that warrant doing so, timber floors constructed in accordance with NZS 3604 do not require additional SED to support bracing elements with a rating up to 120 BU/m.

For further information or if you need assistance with bracing layout and distribution design, feel free to get in touch:

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