BUILD RIGHT

Dwangs – moving with the times

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The need for dwangs, those horizontal blocking pieces used between wall studs, has lessened over the years. Using fewer dwangs and making them narrower than the studs could improve a building's thermal performance.

THE USE OF DWANGS (also known as nogs or nogging in some parts of New Zealand) has evolved as light timber-frame construction methods have changed. It is interesting to look at how our use of dwangs has evolved and how we have arrived at the current situation for use of them.

Dwangs first used here in the 1920s

General use of dwangs in New Zealand light timber-framed building first appeared during the early 1920s. Wall studs until then were typically kauri and rimu, sometimes tōtara, miro and matai, and generally centred at 18" (450 mm). Walls had face-fixed timber internal sarking or match lining and were constructed without dwangs.

The introduction of new internal sheet linings such as plasterboard, hardboard and asbestos cement sheet replaced match linings, and the use of blocking or dwanging between studs became common practice. These provided edge fixing for the linings that were fixed directly to the face of the studs.

From the 1950/60s onwards, treated radiata pine became the most common framing timber.

Dwangs have subsequently been credited, often incorrectly, with providing multiple structural and non-structural functions in our light timber-frame wall construction.

1970s thinking on dwangs

Early 1970s industry literature outlined why dwangs were used at the time.

Use of dwangs or nogs (horizontal blocking timber) has changed over time.

Structurally, dwangs were used to:

- improve racking stiffness and strength of a wall
- support studs against buckling (under vertical loads on the wall)
- support sheet linings to improve their strength and stiffness (perpendicular to wall)
- provide fixing points (behind linings) for accessory fittings.

Non-structurally, dwangs were used to:

- prevent wet studs from twisting or bowing during drying out
- reduce fire hazard by acting as flame and smoke stops within the wall cavity
- improve thermal insulation of the wall by reducing convection within the wall cavity.

Current view very different

Improved building material quality and industry research has since debunked most of these assumptions.

Not helpful for racking resistance or to support studs

We now know that dwangs make a negligible contribution towards the racking resistance of both lined and unlined walls.

They are also not required to support studs laterally against in-plane buckling for any single-storey situation where horizontal board or sheet lining or cladding materials are used.

Remember, though, that temporary lateral support during construction will still be required in many situations.

Only sometimes needed to support linings

Edge support to linings is less black and white. Dwangs provide little extra support for linings on studs up to 480 mm centres. However, they may provide useful support for the edges of horizontally fixed sheets and where there is the probability of high impact loads in a known position.

At the current common-use industry standard of 600 mm stud centres, some studies recommend three rows of dwangs to reduce lining stresses and deflections under load significantly.

A stronger lining may be a better solution than fitting dwangs, or a single row of dwangs at mid-height may provide adequate extra protection.

Blocking specific fixtures

Apart from blocking at known positions to support specific fixtures, the installation of dwangs throughout a building is difficult to justify on the basis of providing fixing points.

Other methods to allow future installation of fixtures are probably cheaper and more efficient.

No longer have wet wall framing

Adding dwangs to limit distortion of adjacent wet studs as they dry out is also probably obsolete in 2020.

In the 1970s, light timber-frame residential constructors traditionally used No. 1 framing grade green framing timber. While grading rules allowed only so much bow, crook and twist to each stud in the green condition, those limits were often exceeded as an unrestrained wet stud dried out in the frame in situ.

Processes such as kiln drying and stress grading have virtually eliminated these problems. Now, with the almost universal provision of kiln-dried framing timber, distortion of wet wall framing as it dries in situ has almost disappeared.

Care must still be taken with the construction programme and process to ensure the framing is protected from the weather as soon as is practicable to prevent rain wetting.

Obsolete as a fire stop

Early New Zealand timber building techniques without dwangs, such as balloon framing, formed enclosed vertical voids that would have enabled fire to spread, and dwangs may have curtailed this risk.

But external perimeter walls now have insulation in the void filling the inter-stud cavity, and localised treatment around any potential fire hazards inside internal walls now performs the same function as universal use of dwangs, at greatly reduced cost.

Dwangs reduce thermal performance

The final 1970s premise – that the presence of dwangs will improve thermal insulation of the wall by reducing convection within the wall cavity void – shows how far building science and our knowledge has evolved over the past half century.

The science is settled – more thermal insulation material and less timber framing will result in walls with better thermal and acoustic performance.

Currently, BRANZ is studying framing ratios in light timber-frame construction and the impact on heat loss. A high ratio with extra studs and dwangs results in less in-wall void space for installing thermal insulation material and creates extra thermal bridging, which decreases the thermal performance of the wall.

NZS 3604:2011 says 45 × 45 mm dwangs

Size is one aspect of current dwang usage that should change.

In current practice, a standard dwang is a 90 × 45 mm member, installed flat and flush with both the inside and outside edge of the stud. This provides a wasteful thermal bridge to the exterior of the building.

NZS 3604:2011 *Timber-framed buildings* has never prescribed use of full-depth dwangs.

The 1978, 1981, 1984 and 1990 editions of NZS 3604 stipulated minimum dimensions of 50 × 50 mm or 75 × 40 mm.

In NZS 3604:1999, this was reduced to 45 × 45 mm or 70 × 35 mm.

NZS 3604:2011 reduced dwang minimum dimensions further to just 45 × 45 mm. When installing, these dwangs usually only need to be flush with the interior wall surface.

Best practice

Dwangs should be narrower than the studs – a minimum of 45 × 45 mm, installed flush with the interior wall surface.

Binning the default practice of using framing-sized dwangs and minimising their use to only where necessary could benefit our environment and the standard of light timber-frame buildings.