GN GUIDELINES NO.232

ANOTHER MITEK ADVANTAGE – NOVEMBER 2016

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Wind beam design: part 1

The problem
Over the past few weeks I have had a spate of enquiries related to the design of wind beams for residential buildings. With enquiries ranging from "what is a wind beam?" to "what size of wind beam do I need?", I thought it would be a good time to expand upon the topic.

What is a wind beam?
A wind beam, in residential timber framed construction, is a horizontal beam element installed within an external wall frame which resists horizontal wind loads applied to it from the connecting upper and lower storey wall frames. The wind beam must be restrained at its ends by bracing walls in order to be effective.

Where are they commonly used?
Typically, wind beams are only provided in two storey buildings where a full height void region exists between the first floor and ground floor. These void regions commonly fall within stair wells and entrance lobbies as shown in figure 1.

Conventional wall framing methodology
The traditional wall framing methodology to construct high void walls is to have full height wall studs spanning from the ground floor slab right up to the first floor ceiling. As you will see in the case study provided, framing out as per this method may not be the most efficient use of timber.

To illustrate how wind beams can be used to improve efficiencies, take look at the following case study. Let's assume we have a full height void region with the following design conditions:

> Utilising wind beam solutions vs. conventional framing.

DESIGN CRITERIA	
• Void region height : 5.6m	• Concrete tile roof
• Void region length: 3.6m	• 13mm plasterboard/direct
• Truss span supported: 7m	• Roof pitch: 20 deg
• Truss spacing: 600mm crs	• Wind Speed: N2 (40 m/s)

CASE STUDY - CONVENTIONAL FRAMING

A summary of the timber required to frame out the design wall with the full height stud solution, as shown in Figure 1, is provided in Table 1.

Table 1: Traditional Framing of wall

Wall frame member	Member size/ grade	Deflection of member (mm)	Total no. lengths/ length	Total length of timber (m)
Studs	4/90x45 @ 450crs hySPAN	13.64	28@5.51m	154.28
Top plate	45x90	N/A	1@3.6m	3.6
Bottom plate	45x90	N/A	1@3.6m	3.6
			Total timber required (m)	161.48

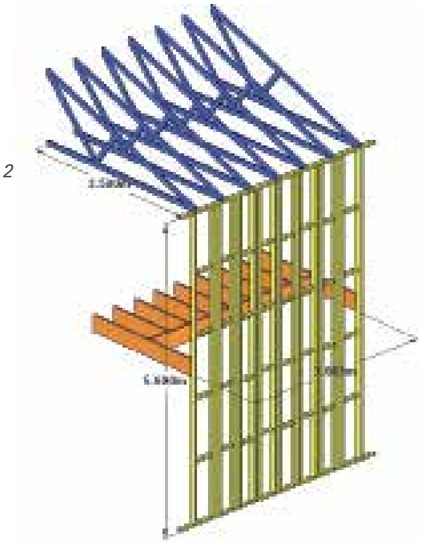
CASE STUDY - WIND BEAM

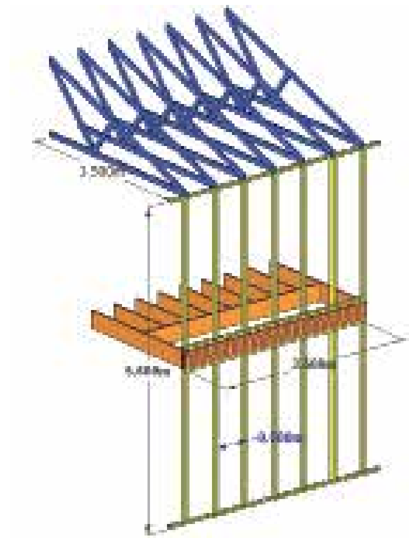
Now let's compare the wind beam framing solution for the wall as shown in Figure 2. The timber required to frame out the wall with the wind beam solution is provided in Table 2.

Table 2: Wind beam solution for wall

Member	Member Size/Grade	Deflection of member (mm)	Total No of Lengths/length	Total length of timber (m)
Studs	90x45 @ 600crs MGP10	2.13	10@2.56m	25.6
Top plate	45x90	N/A	2@3.6m	7.2
Bottom plate	45x90	N/A	2@3.6m	7.2
Wind beam	6/45x90 MGP12	10.83	6@3.6m	21.6
			Total timber required (m)	61.6

Left: *Figure 1*
Right: *Figure 2*





The main benefit, which we can observe by comparing the data in the tables, is that approximately 60 percent less timber is required in the wind beam solution compared with the full stud height solution. Additionally lower grades of timber can be more readily utilised in the wind beam solution, leading to greater cost savings.

What other benefits are achieved by utilising a wind beam solution over a traditional full height stud solution for void region framing?

Full height wall frames are harder to prefab manufacture, harder to transport and harder to manoeuvre onsite compared with standard single storey wall frames.

Wall frames in the void region incorporating wind beams can replicate the common wall frame height, as long as the wind beam can fit within the depth of the floor container. The wall frames above and below the wind beam can also be fabricated with shorter more common lengths of lower grade timber.

Window openings in void regions are also easier to design where wind beams are installed, as the difficulty of designing full height void jambs studs at the sides of window openings is eradicated.

In Part 2 we will look more closely at the design methodology in AS1720.3-2016 which details design loads and deflection limits for wind beams. T