EBSS

Evidence Based Seismic Strengthening

The Minister's new clothes

EBSS' assessment of the Government's new seismic strengthening policy

The key take-outs from our assessment are:

- The policy remains wedded to the %NBS risk assessment framework which is flawed and produces some absurd risk assessments.
- The slowdown in the implementation of policy for low seismic areas, for some classes of buildings, may not be real. Centralised control over assessment time tables, combined with misinformation about building risk, could force owners to strengthen over just a few years, not the maximum of 50 years.

The Good

%NBS trigger point arbitrary

The Minister says that the 34 %NBS earthquake prone building trigger point is 'arbitrary'. We agree. It is not based on any consideration of the costs and benefits of reaching the trigger point, or even on any analysis of life safety. It is good that the Minister has acknowledged this. Where we part company is that we do not think that the flawed %NBS framework should be at the centre of seismic strengthening policy.

Assessment numbers

The number of buildings that need to be assessed will be reduced from 500,000 to 30,000 buildings that pose the 'greatest risk'. We don't agree that there are 30,000 buildings in the country that pose a material risk, but it is good to see that hundreds of millions of dollars will not be wasted assessing buildings (and fences, walls etc.) that do not pose any discernable risk.

We assume that the assessment numbers were considered by MBIE before the current Bill was introduced. What were they thinking?

The bad

Some of the numbers in the speech are wrong or potentially misleading. As most people will rely on these numbers to assess the logic and merits of the proposals, it is important that they are right.

Auckland is 450-500 times less risky than Wellington not 50 times

The Minister concludes, on the basis of a comparison of the frequency of earthquakes 'likely to cause fatalities' (one in 120 years in Wellington compared to one in 7400 years in Auckland), that you are over 50 times less at risk from an earthquake in Auckland than in Wellington. We did the numbers using the same source data (GNS Science) as the Minister and found that Auckland was 450-500 times less risky than Wellington.

The problem with the Minister's methodology is that it puts a heavy weight on the relative frequency of earthquakes that are very unlikely to cause fatalities. To explain, the relative frequency of earthquakes (described as MMI 8) that could possibly result in fatalities (but with a extremely low probability) is roughly 50 to one. But once we consider stronger earthquakes where there is a much more significant risk, the difference in relative frequency is much greater.

The frequency of MMI 9 (or greater) earthquakes is one in 400 years in Wellington (source: Martin Jenkins report 2012 review), but one in 120,000 years in Auckland, a relative difference of 300. Putting all the relative frequency numbers, and the different risks that there will be fatalities with earthquakes of different magnitudes, together generates a risk difference of 450-500.

The Minister's error is apparent from the data he presents on earthquake fatalities. Eighty percent of expected fatalities are in Wellington, but just 0.5 percent in Auckland. Auckland's population is about three times Wellington's so when we do the maths we get:

$$(80/0.5) \times 3 = 480$$

300 more fatalities?

The fundamental justification for the policy is saving lives. Here we are told that the policy will result in an estimated 330 fewer deaths over the next century. When Martin Jenkins and GNS Science did the analysis for the Ministry in 2012 they found that the average lives lost to earthquakes in New Zealand per year was 0.96. Reaching the 34%NBS standard reduced this number to 0.72.

On our arithmetic this equates to 24 lives saved over the next century (the actual number will be less because even without strengthening requirements a large number existing of buildings will naturally be replaced with stronger modern ones).

Quite how the Minister came up with the figure of 330 fatalities (of which 264 will be in Wellington) is a mystery at this point.

We will be asking the Minister and MBIE under the Official Information Act to provide the documents that explain where the 330 fatality number comes from. Our analysis of the documents will be shared on this site.

Costs of earthquake strengthening understated

The Minister said that the new policies will result in a reduction in the costs of seismic strengthening from $1360 million to $777 million. A slow down in the implementation of the %NBS regime will result in a reduction in the economic cost of the policies because future costs are discounted to a present value. However, it not at all clear that in practice there will be much of a slowdown. Centralised control over the assessment process, combined with what can only be described as a public misinformation campaign (see below), can force early strengthening or demolition. The requirement to meet the standards when there is a significant alteration to a building will have the same effect.

The starting cost figure of $1360 million appears to be based on the MBIE 2012 analysis, but that figure was clearly way too low. The Tailrisk Economics assessment in 'Error Prone Bureaucracy' put the economic cost at around $10 billion. The benefits were estimated at under $100 million. We will analyse the Ministry's figures once the relevant documents have been obtained under the Official Information Act, and will do a re-assessment of the economic costs. It appears, at this point, that the potential costs of the new policy could still be very high.

Risk compared to driving a car

The Minister says that we are 100 times more likely to die in a car accident than an earthquake. The number of road deaths per year is about 370. With expected deaths in earthquakes of 0.96 per year, the ratio is 385. The Minister has obviously used different figures and these also appear to be different from the ones he used to calculate the lives saved with the new policy.

The New Zealand relative risk figure is an average and averages in this context are

misleading. Using the numbers the Minister presented on Auckland's share of earthquake fatalities, we find that Aucklanders are 24,000 times more likely to die on the roads than in an earthquake. But people spend much more time in buildings than in cars, so if the comparison is made in terms of the relative risk per hour, being on the roads is something like 200,000 times more risky.

The ugly

%NBS risk measurement framework retained

The worst thing about the new proposals is that the Minister has stuck with the New Zealand Society of Earthquake Engineering's (NZSEE) %NBS risk measurement framework. As currently calibrated it is badly flawed. For a full explanation read the document **'The NZSEE's % NBS risk measurement framework: Why it doesn't work'** available at http://ebss.org.nz/papers/.

Amongst the problems with the framework are:

- The %NBS trigger point of 34 was just plucked out of the air with no analysis of costs and benefits or of life safety risk. For a history read '**Error Prone Bureaucracy'.**
- Different buildings in the same town with the same %NBS can have quite different life safety risks.
- Buildings with the same %NBS is different towns can have very different risks. The %NBS system is meant to be risk sensitive by adjusting for differences in seismicity but it makes only minor adjustments. As a result an 'earthquake prone building' in Auckland can be more than 100 times safer than an identical building in Wellington. To understand why this happens read the '**The Flaw in the Score'**.
- The framework can be manipulated by parties with a financial interest in the outcome to generate more 'earthquake prone buildings'.

MBIE will have control over a single implementation policy framework

The details are not available yet, but it appears that MBIE will be in the driving seat when setting the detail of the timetables for the evaluation of buildings. The Minister has set out a set of deadlines for the completion of the evaluations, but MBIE could well push for earlier deadlines for certain classes of buildings. It will also be a lottery whether a particular building is assessed early or late. Once a building is assessed as 'earthquake prone', it will be slapped with an orange or red notice that could have a devastating impact on its value (see below).

So what appears to be a 'let-off' for Auckland, with a time to strengthen of up to 50 years, may be nothing of the sort. A building owner may have just a few years before being effectively compelled to strengthen.

Public information system will spread false information about buildings

The Minister intends to impose a system that is designed to 'encourage' owners to upgrade or demolish well ahead of the proposed deadlines. The Minister said, *"We are also working to drive upgrades through people being more aware of the earthquake resistance of buildings. There will be a publicly available register and website listing all earthquake-prone buildings. Buildings will be required to have notices at their entrance stating where they are below the minimum standard. We also intend such information to include the actual percentage of code with a red notice for those under 20 per cent and orange below 34 per cent. This reflects that the risk is substantially greater, as much as 10 times, for buildings well under the 34 per cent definition of an earthquake-prone building. These notices and extra information will influence customers and tenants and as a result building owners to strengthen buildings ahead of the maximum timeframe*."

The notices will give a completely false picture of seismic risk. We have calculated the life safety risk of buildings in Auckland, New Plymouth and Wellington that are likely to 'wear' the yellow or red notices. We have used the data that was provided to MBIE by GNS Science for their 2012 review.

	Odds of death over one year 40 hours occupancy	**EBSS risk rating**
Auckland Unreinforced Masonry Building (defective)	1 in 60,000,000	**No effective risk**
New Plymouth URM (sound)	1 in 9,000,000	**No effective risk**
Wellington URM (sound)	1 in 300,000	**Very low risk**

As a point of comparison, flying has similar characteristics to earthquakes. There is a very small chance that there will be a catastrophic event that results in death. The chance of being killed, per hour, when flying is 4000 times greater than being in a typical Auckland 'earthquake prone' building. For New Plymouth buildings it is about 600 times greater, and for Wellington 20 times.

We fly because we know that flying is very safe. But the Auckland, New Plymouth and Wellington buildings will be shunned because they will be falsely identified as ‘high risk’ when there is overwhelming evidence that they are not.

Under common law we believe that the notices will be a ‘slander of title’. A slander of title involves a party publishing matter that is untrue, is disparaging to another's property, and which impacts on the value of that property. The owner could be entitled to damages for the loss of economic value or for expenses unnecessarily incurred.

What we appear to be heading towards with the new policy is a system of state sanctioned slander.