REVISED VERSION OF C5
TALKING ABOUT %NBS

October 2019

This information for engineers should be read alongside **our factsheet** introducing the revised (yellow) version of C5, and **this information** released by MBIE.

We've developed this factsheet to provide guidance about how you should use the revised (yellow) version of C5 when giving a *%NBS* rating, and to help you advise owners of buildings with low ratings.

If a building has a rating of less than 34*%NBS*, this points to a definite need to address its vulnerable structural features within a reasonable period of time. However, a rating of less than 34%NBS does not mean the building is dangerous or poses an imminent risk. In most cases, from an engineering risk perspective, it can continue to be occupied. Decisions around the continued occupancy of a low-rating building are the responsibility of the owner and tenants.

FREQUENTLY ASKED QUESTIONS

What is a *%NBS* rating?

A *%NBS* rating indicates the percentage of the New Building Standard that a building achieves in terms of protecting life in earthquakes.

When you calculate a *%NBS* rating, you are basically assessing the capability of a building to resist earthquake shaking. You do this by determining its probable capacity to resist shaking and comparing this against the ultimate limit state loading requirements for new buildings defined in the New Zealand Earthquake Loadings Standard issued on 1 July 2017 (NZS1170.5).

What's the purpose of *%NBS* ratings?

The *%NBS* rating provides an indication of how well the building protects life when compared with a hypothetical similar new building on that same site that just complies with the minimum standard required by the Building Code.

A *%NBS* rating allows comparison between buildings as well as against the earthquake-prone building requirements.

It's worth pointing out that correctly designed and constructed new buildings can be expected to have equivalent ratings well in excess of 100*%NBS*.

What are the limitations of *%NBS* ratings?

A *%NBS* rating doesn't predict how the building will perform in a particular earthquake. Earthquakes have a range of different ground-shaking effects. How a certain earthquake affects a specific building at a particular site depends on many factors. These include the earthquake itself, local geological and geotechnical features, the characteristics of that specific building and how all of these factors interact.

This means a *%NBS* rating does not represent an absolute assessment of risk or safety. For example, a rating of less than 34*%NBS* does not mean a building poses an imminent risk nor is that building expected to collapse in moderate levels of earthquake shaking. However, that building is expected to present a greater risk to life during earthquake shaking than a building with a significantly higher rating.

%NBS is only about performance in terms of protecting people's lives. A *%NBS* rating says nothing about likely damage to the building. If a building has a high *%NBS* rating, this doesn't mean it won't be damaged by an earthquake; it means people are more likely to be able to escape unharmed. If a building has a high *%NBS* rating, it isn't necessarily less likely to be damaged during an earthquake than a building with a low *%NBS* rating.

How does a building's occupancy or use affect *%NBS*?

If a building has a higher occupancy than defined for typical use, it's measured against a higher seismic standard. Remember that *%NBS* rating is relative to the standard required of a similar new building.

For example, if you assess a building that features crowd loadings, it will be characterised as Importance Level 3 (IL3). If you assess that building as 50%NBS, it will be against the higher IL3 standard. It therefore achieves a higher seismic standard than an office building that's rated at 50%NBS but against the lower IL2 standard. This is why it is important to include the Importance Level with the assessment rating – for example, 50*%NBS* (IL3).

Are all buildings rated at less than 34*%NBS* considered to be earthquake prone?

Buildings are determined by the Territorial Authority (TA) to be earthquake prone if they fall below the threshold set out under the Building Act 2004.

If a TA suspects that a building is earthquake prone, they will advise the owner that the building is potentially earthquake prone and will request an engineering assessment to confirm its status. When you carry out this assessment, you can only use the 2017 Red Book version of C5, because this version is the one formally recognised under MBIE's EPB methodology. The TA will then determine if the building is earthquake prone if it's rated under 34*%NBS*.

If you assess a building using the Yellow version of C5, and this results in a rating of less than 34*%NBS*, in the current regulatory environment this assessment will not lead to the building being earthquake prone.

How risky are earthquake-prone buildings (or buildings rated at less than 34*%NBS*)?

A rating of less than 34*%NBS* indicates a risk to occupants of approximately 10 to 25 times that of an equivalent new building that just meets the minimum life safety requirements in the New Zealand Building Code.

However, you need to put that in the context of the seismic risk we expect of new buildings. The target for new buildings is around 1 in 1,000,000 chance of a fatality – a very low level of risk. This is similar to the risk of death by lightning strike, for example.

To provide another perspective, if a building is rated at 34*%NBS*, it has the same likelihood of collapse in moderate levels of earthquake shaking as a new building has under full design-level shaking.

We tolerate similar or greater levels of risks in other contexts. For example, your chance of dying in a plane crash is about 1 in 100,000. In 2016, 1 in 15,000 New Zealanders died on our roads.

Who should make the decision on continuing to occupy a building rated less than 34*%NBS*?

Decisions around continued occupancy of a building that has a rating of less than 34*%NBS* should be made by owners and occupants. These decisions need to reflect a range of risk considerations – including the low likelihood of a major earthquake occurring in the short term prior to strengthening – and are not engineering decisions.

How long does an owner have to deal with an earthquake-prone building?

The Government has put legislation in place requiring earthquake-prone buildings to be upgraded or removed, over time. For earthquake-prone buildings in Wellington, which is a high seismic-risk area, the new legislation sets a maximum time frame of 15 years for non-priority buildings. This legislated period represents the time over which Parliament considers the heightened risk can be tolerated and addressed without affecting occupancy.

Do earthquake-prone buildings present a health and safety risk?

WorkSafe New Zealand issued a policy clarification in 2018 that says if you're a Person Conducting a Business or Undertaking that owns or occupies an earthquake-prone building and you're meeting the earthquake performance requirements of the Building Act 2004, WorkSafe will not enforce to a higher standard under the Health and Safety at Work Act. It also says:

> *If a building is found to be earthquake-prone, this doesn't necessarily mean it shouldn't be occupied. The Building Act provides a period of several years for strengthening or demolition work to be undertaken. While the risk of harm to people in or around an earthquake-prone building is greater than an equivalent new building, this doesn't typically require short-term action.*

You should always encourage owners of earthquake-prone buildings to begin preparing strengthening plans to remove the earthquake-prone status within much shorter timeframes than the minimum mandated in the legislation.

What about buildings assessed at less than 34*%NBS* but not defined as earthquake prone?

Essentially the same risk considerations apply as in the answer above.

As for earthquake-prone buildings, the focus should be on addressing the issues that lead to the building's low rating within as short a time frame as is practicable.