Design, construction, seismic performance of non-structural elements in New Zealand

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Abstract. The performance of buildings in recent New Zealand earthquakes, delivered stark lessons on seismic resilience. Most of our buildings, with a few notable exceptions, performed as our Codes intended them to, that is, to safeguard people from injury. Many buildings only suffered minor structural damage but were unable to be reused and occupied for significant periods of time due to the damage and failure of non-structural elements. The performance of our buildings has led many to ask if we have the right balance between designing to preserve life in extreme, infrequent events versus designing for lesser more frequent events that enable continued functional use of the buildings, in a way that meets the needs and expectations of our communities.

Improving the seismic performance of non-structural elements will minimise the need to close buildings for repair after earthquakes which will lead to improved resilience of the organisations and entities that occupy the buildings. Reduced damage and need for repair and replacement of non-structural elements will also reduce the amount of waste generated to restore buildings and consequently reduce the Whole-of-Life embodied carbon emissions from our buildings.

This paper provides an overview of the design, coordination and installation practices in New Zealand prior to 2016 and discusses the changes that are currently occurring in the industry as a result of the lessons learned over the last decade. The second part of this paper discusses how improving the seismic of performance of non-structural elements requires a holistic view of the response and function of the building. It also highlights the importance of understanding how the structural response not only affects the design, coordination and construction of non-structural elements but also discusses how residual drift and damage of the structure can affect the restoration of the non-structural elements post-earthquake, such that without careful consideration the non-structural elements can be more vulnerable to damage in future earthquake events.